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The Victoria History of the Counties of England

EDITED BY WILLIAM PAGE, F.S.A.

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HISTORY OF CORNWALL

IN FOUR VOLUMES

VOLUME I


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THE
VICTORIA HISTORY
OF THE COUNTIES
OF ENGLAND
CORNWALL



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INSCRIBED
TO THE MEMORY OF
HER LATE MAJESTY
QUEEN VICTORIA
WHO GRACIOUSLY GAVE
THE TITLE TO AND
ACCEPTED THE
DEDICATION OF
THIS HISTORY

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GENERAL ADVERTISEMENT

The VICTORIA HISTORY of the Counties of England is a National Historic Survey which, under the direction of a large staff comprising the foremost students in science, history, and archæology, is designed to record the history of every county of England in detail. This work was, by gracious permission, dedicated to Her late Majesty Queen Victoria, who gave it her own name. It is the endeavour of all who are associated with the undertaking to make it a worthy and permanent monument to her memory.

Rich as every county of England is in materials for local history, there has hitherto been no attempt made to bring all these materials together into a coherent form.

Although from the seventeenth century down to quite recent times numerous county histories have been issued, they are very unequal in merit; the best of them are very rare and costly; most of them are imperfect and many are now out of date. Moreover, they were the work of one or two isolated scholars, who, however scholarly, could not possibly deal adequately with all the varied subjects which go to the making of a county history.

In the VICTORIA HISTORY each county is not the labour of one or two men, but of many, for the work is treated scientifically, and in order to embody in it all that modern scholarship can contribute, a system of co-operation between experts and local students is applied, whereby the history acquires a completeness and definite authority hitherto lacking in similar undertakings.

The names of the distinguished men who have joined the Advisory Council are a guarantee that the work represents the results of the latest discoveries in every department of research, for the trend of modern thought insists upon the intelligent study of the past and of the social, institutional, and political developments of national life. As these histories are the first in which this object has been kept in view, and modern principles applied, it is hoped that they will form a work of reference no less indispensable to the student than welcome to the man of culture.

THE SCOPE OF THE WORK

The history of each county is complete in itself, and in each case its story is told from the earliest times, commencing with the natural features and the flora and fauna. Thereafter follow the antiquities, pre-Roman, Roman, and post-Roman; ancient earthworks; a new translation and critical study of the Domesday Survey; articles on political, ecclesiastical, social, and economic history; architecture, arts, industries, sport, etc.; and topography. The greater part of each history is devoted to a detailed description and history of each parish, containing an account of the land and its owners from the Conquest to the present day. These manorial histories are compiled from original documents in the national collections and from private papers. A special feature is the wealth of illustrations afforded, for not only are buildings of interest pictured, but the coats of arms of past and present landowners are given.

HISTORICAL RESEARCH

It has always been, and still is, a reproach that England, with a collection of public records greatly exceeding in extent and interest those of any other country in Europe, is yet far behind her neighbours in the study of the genesis and growth of her national and local institutions. Few Englishmen are probably aware that the national and local archives contain for a period of 800 years in an almost unbroken chain of evidence, not only the political, ecclesiastical, and constitutional history of the kingdom, but every detail of its financial and social progress and the history of the land and its successive owners from generation to generation. The neglect of our public and local records is no doubt largely due to the fact that their interest and value is known to but a small number of people, and this again is directly attributable to the absence in this country of any endowment for historical research. The government of this country has too often left to private enterprise work which our continental neighbours entrust to a government department. It is not surprising, therefore, to find that although an immense amount of work has been done by individual effort, the entire absence of organization among the workers and the lack of intelligent direction has hitherto robbed the results of much of their value.

In the VICTORIA HISTORY, for the first time, a serious attempt is made to utilize our national and local muniments to the best advantage by carefully organizing and supervising the researches required. Under the direction of the Records Committee a large staff of experts has been engaged at the Public Record Office in calendaring those classes of records which are fruitful in material for local history, and by a system of interchange of communication among workers under the direct supervision of the general editor and sub-editors a mass of information is sorted and assigned to its correct place, which would otherwise be impossible.

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FAMILY HISTORY

Family History is, both in the Histories and in the supplementary genealogical volumes of chart Pedigrees, dealt with by genealogical experts and in the modern spirit. Every effort is made to secure accuracy of statement, and to avoid the insertion of those legendary pedigrees which have in the past brought discredit on the subject. It has been pointed out by the late Bishop of Oxford, a great master of historical research, that 'the expansion and extension of genealogical study is a very remarkable feature of our own times,' that 'it is an increasing pursuit both in America and in England,' and that it can render the historian most useful service.

CARTOGRAPHY

In addition to a general map in several sections, each History contains Geological, Orographical, Botanical, Archæological, and Domesday maps; also maps illustrating the articles on Ecclesiastical and Political Histories, and the sections dealing with Topography. The Series contains many hundreds of maps in all.

ARCHITECTURE

A special feature in connexion with the Architecture is a series of ground plans, many of them coloured, showing the architectural history of castles, cathedrals, abbeys, and other monastic foundations.

In order to secure the greatest possible accuracy, the descriptions of the Architecture, ecclesiastical, military, and domestic, are under the supervision of Mr. C. R. PEERS, M.A., F.S.A., and a committee has been formed of the following students of architectural history who are referred to as may be required concerning this department of the work :—

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GENEALOGICAL VOLUMES

The genealogical volumes contain the family history and detailed genealogies of such houses as had at the end of the nineteenth century seats and landed estates, having enjoyed the like in the male line since 1760, the first year of George III., together with an introductory section dealing with other principal families in each county.

The general plan of Contents and the names among others of those who are contributing articles and giving assistance are as follows :—

Natural History

Geology. CLEMENT REID, F.R.S., HORACE B. WOODWARD, F.R.S., and others

Palæontology. R. LYDEKKER, F.R.S., etc.

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Anglo-Saxon Remains. C. HERCULES READ, F.S.A., REGINALD A. SMITH, B.A., F.S.A., and others

Domesday Book and other kindred Records. J. HORACE ROUND, M.A., LL.D., and other Specialists

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Ecclesiastical History. R. L. POOLE, M.A., and others

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Maritime History of Coast Counties. Prof. J. K. LAUGHTON, M.A., M. OPPENHEIM, and others

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Hunting }
Shooting } By Various Authorities
Fishing, etc. }

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McKay

THE
VICTORIA HISTORY
OF THE COUNTY OF
CORNWALL

EDITED BY
WILLIAM PAGE, F.S.A.

VOLUME ONE



LONDON
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PREFACE

THE antiquities of Cornwall are of such extreme interest that they have to a large extent absorbed the attention of the antiquaries and archaeologists of the county, causing the history of the county to be somewhat neglected. Cornwall has nevertheless had its share of county historians, first among whom is Richard Carew, of Antony, who published his quaint and entertaining *Survey of Cornwall* in 1602. It is, however, to Dr. William Borlase that we turn as the principal historian of the county. His interests at first were given to natural history, but later in life he devoted most of his attention to archaeology. In 1774 he published the first edition of his *Cornish Antiquities*, which, although many of his deductions are by later study shown to be erroneous, is the foundation of archaeological research in the county. In his declining years he planned a parochial history of Cornwall, which, however, was never published.

The Reverend Richard Polwhele published the first part of his *History of Cornwall* in 1803, in which he gives a general survey of the county, but with little detail as to parochial history.

In 1838 Davies Gilbert, who had changed his name from Giddy, published *The Parochial History of Cornwall* in four volumes. This was founded upon *The Complete History of Cornwall* by William Hals, a work that was never finished, and the manuscript 'History of Cornwall' by Thomas Tonkin, which had come into the possession of Lord de Dunstanville. Gilbert's work only gives notes about the parishes in the county without any attempt to trace the descents of the manors.

Many histories of separate parishes and districts in Cornwall have been written, the most noteworthy of which has been the *History of Trigg Minor* by Sir John Maclean, and the Royal Institution of Cornwall has done some excellent work towards the study of the history and archaeology of the county.

The Editor wishes to express his indebtedness to the Reverend Thomas Taylor, M.A., F.S.A., for his constant help; to the Bishop of Gibraltar, Mr. J. D. Enys, F.G.S., Mr. Thurstan C. Peter and Mr. Michell Whitley for assistance and advice; to Mr. I. Chalkley Gould, F.S.A., for notes regarding the article on Earthworks; to many who assisted with the article on Industries, and to Mr. C. W. Dymond, the Society of Antiquaries, and the Royal Institution of Cornwall for the use of blocks for illustrations.

TABLE OF ABBREVIATIONS

| | | | |
|--------------------------------------|--|----------------------------------|---|
| Abbrev. Plac. (Rec. Com.) | Abbreviatio Placitorum (Record Commission) | Chartul. | Chartulary |
| Acts of P.C. . . . | Acts of Privy Council | Chas. | Charles |
| Add. | Additional | Ches. | Cheshire |
| Add. Chart. . . . | Additional Charters | Chest. | Chester |
| Admir. | Admiralty | Ch. Gds. (Exch. K.R.) | Church Goods (Exchequer King's Remembrancer) |
| Agarde | Agarde's Indices | Chich. | Chichester |
| Anct. Corresp. . . . | Ancient Correspondence | Chron. | Chronicle, Chronica, etc. |
| Anct. D. (P.R.O.) | Ancient Deeds(Public Record Office) A 2420 | Close | Close Roll |
| Ann. Mon. | Annales Monastici | Co. | County |
| Antiq. | Antiquarian or Antiquaries | Colch. | Colchester |
| App. | Appendix | Coll. | Collections |
| Arch. | Archæologia or Archæological | Com. | Commission |
| Arch. Cant. | Archæologia Cantiana | Com. Pleas | Common Pleas |
| Archd. Rec. | Archdeacons' Records | Conf. R. | Confirmation Rolls |
| Archit. | Architectural | Co. Plac. | County Placita |
| Assize R. | Assize Rolls | Cornw. | Cornwall |
| Aud. Off. | Audit Office | Corp. | Corporation |
| Aug. Off. | Augmentation Office | Cott. | Cotton or Cottonian |
| Ayloffe | Ayloffe's Calendars | Ct. R. | Court Rolls |
| | | Ct. of Wards | Court of Wards |
| | | Cumb. | Cumberland |
| | | Cur. Reg. | Curia Regis |
| Bed. | Bedford | D. | Deed or Deeds |
| Beds | Bedfordshire | D. and C. | Dean and Chapter |
| Berks | Berkshire | De Banc. R. | De Banco Rolls |
| Bdle. | Bundle | Dec. and Ord | Decrees and Orders |
| B.M. | British Museum | Dep. Keeper's Rep. | Deputy Keeper's Reports |
| Bodl. Lib. | Bodley's Library | Derb. | Derbyshire or Derby |
| Boro. | Borough | Devon | Devonshire |
| Brev. Reg. | Brevia Regia | Dioc. | Diocese |
| Brit. | Britain, British, Britannia, etc. | Doc. | Documents |
| Buck. | Buckingham | Dods. MSS. | Dodsworth MSS |
| Bucks | Buckinghamshire | Dom. Bk. | Domesday Book |
| | | Dors. | Dorsetshire |
| Cal. | Calendar | Duchy of Lanc. . . . | Duchy of Lancaster |
| Camb. | Cambridgeshire or Cambridge | Dur. | Durham |
| Cambr. | Cambria, Cambrian, Cambrensis, etc. | | |
| Campb. Ch. | Campbell Charities | East. | Easter Term |
| Cant. | Canterbury | Eccl. | Ecclesiastical |
| Cap. | Chapter | Eccl. Com. | Ecclesiastical Commission |
| Carl. | Carlisle | Edw. | Edward |
| Cart. Antiq. R. . . . | Cartæ Antiquæ Rolls | Eliz. | Elizabeth |
| C.C.C. Camb. | Corpus Christi College, Cambridge | Engl. | England or English |
| Certiorari Bdles. (Rolls Chap.) | Certiorari Bundles (Rolls Chapel) | Engl. Hist. Rev. . . . | English Historical Review |
| Chan. Enr. Decree R. | Chancery Enrolled Decree Rolls | Enr. | Enrolled or Enrolment |
| Chan. Proc. | Chancery Proceedings | Epis. Reg. | Episcopal Registers |
| Chant. Cert. | Chantry Certificates (or Certificates of Colleges and Chantries) | Esch. Enr. Accts. . . . | Escheators Enrolled Accounts |
| Chap. Ho. | Chapter House | Excerptæ e Rot. Fin. (Rec. Com.) | Excerpta e Rotulis Finium (Record Commission) |
| Charity Inq. | Charity Inquisitions | Exch. Dep. | Exchequer Depositions |
| Chart. R. 20 Hen. III. pt. i. No. 10 | Charter Roll, 20 Henry III. part i. Number 10 | Exch. K.B. | Exchequer King's Bench |
| | | Exch. K.R. | Exchequer King's Remembrancer |
| | | Exch. L.T.R. | Exchequer Lord Treasurer's Remembrancer |

TABLE OF ABBREVIATIONS

| | | | |
|--------------------------------|---|---|---|
| Exch. of Pleas, Plea R. | Exchequer of Pleas, Plea Roll | Memo. R. . . . | Memoranda Rolls |
| Exch. of Receipt . | Exchequer of Receipt | Mich. | Michaelmas Term |
| Exch. Spec. Com. . | Exchequer Special Commis- sions | Midd. | Middlesex |
| | | Mins. Accts. . . | Ministers' Accounts |
| | | Misc. Bks. (Exch. K.R., Exch. T.R. or Aug. Off.) | Miscellaneous Books (Ex- chequer King's Remem- brancer, Exchequer Trea- sury of Receipt or Aug- mentation Office) |
| Feet of F. | Feet of Fines | Mon. | Monastery, Monasticon |
| Feod. Accts. (Ct. of Wards) | Feodaries Accounts (Court of Wards) | Monm. | Monmouth |
| Feod. Surv. (Ct. of Wards) | Feodaries Surveys (Court of Wards) | Mun. | Muniments or Munimenta |
| Feud. Aids | Feudal Aids | Mus. | Museum |
| fol. | Folio | | |
| Foreign R. | Foreign Rolls | | |
| Forest Proc. . . . | Forest Proceedings | N. and Q. . . . | Notes and Queries |
| | | Norf. | Norfolk |
| Gaz. | Gazette or Gazetteer | Northampt. . . | Northampton |
| Gen. | Genealogical, Genealogica, etc. | Northants . . . | Northamptonshire |
| | | Northumb. . . . | Northumberland |
| Geo. | George | Norw. | Norwich |
| Glouc. | Gloucestershire or Gloucester | Nott. | Nottinghamshire or Notting- ham |
| Guild Certif.(Chan.) | Guild Certificates (Chancery) | N.S. | New Style |
| Ric. II. | Richard II. | | |
| | | Off. | Office |
| Hants | Hampshire | Orig. R. | Originalia Rolls |
| Harl. | Harley or Harleian | O.S. | Ordnance Survey |
| Hen. | Henry | Oxf. | Oxfordshire or Oxford |
| Heref. | Herefordshire or Hereford | | |
| Hertf. | Hertford | p. | Page |
| Herts | Hertfordshire | Palmer's Ind. . . | Palmer's Indices |
| Hil. | Hilary Term | Pal. of Chest. . . | Palatinate of Chester |
| Hist. | History, Historical, Historian, Historia, etc. | Pal. of Dur. . . . | Palatinate of Durham |
| | | Pal. of Lanc. . . . | Palatinate of Lancaster |
| Hist. MSS. Com. . . | Historical MSS. Commission | Par. | Parish, parochial, etc. |
| Hosp. | Hospital | Parl. | Parliament or Parliamentary |
| Hund. R. | Hundred Rolls | Parl. R. | Parliament Rolls |
| Hunt. | Huntingdon | Parl. Surv. | Parliamentary Surveys |
| Hunts | Huntingdonshire | Partic. for Gts. . | Particulars for Grants |
| | | Pat. | Patent Roll or Letters Patent |
| Inq. a.q.d. | Inquisitions ad quod damnum | P.C.C. | Prerogative Court of Canter- bury |
| Inq. p.m. | Inquisitions post mortem | Pet. | Petition |
| Inst. | Institute or Institution | Peterb. | Peterborough |
| Invent. | Inventory or Inventories | Phil. | Philip |
| Ips. | Ipswich | Pipe R. | Pipe Roll |
| Itin. | Itinerary | Plea R. | Plea Rolls |
| | | Pop. Ret. | Population Returns |
| Jas. | James | Pope Nich. Tax. (Rec. Com.) | Pope Nicholas' Taxation (Re- cord Commission) |
| Journ. | Journal | P.R.O. | Public Record Office |
| | | Proc. | Proceedings |
| Lamb. Lib. | Lambeth Library | Proc. Soc. Antiq. . | Proceedings of the Society of Antiquaries |
| Lanc. | Lancashire or Lancaster | pt. | Part |
| L. and P. Hen. VIII. | Letters and Papers, Hen. VIII. | Pub. | Publications |
| Lansd. | Lansdowne | | |
| Ld. Rev. Rec. . . . | Land Revenue Records | R. | Roll |
| Leic. | Leicestershire or Leicester | Rec. | Records |
| Le Neve's Ind. . . . | Le Neve's Indices | Recov. R. | Recovery Rolls |
| Lib. | Library | Rentals and Surv. . | Rentals and Surveys |
| Lich. | Lichfield | Rep. | Report |
| Linc. | Lincolnshire or Lincoln | Rev. | Review |
| Lond. | London | Ric. | Richard |
| | | | |
| m. | Membrane | | |
| Mem. | Memorials | | |

TABLE OF ABBREVIATIONS

| | | | |
|---|--|---------------------------|---|
| Roff. | Rochester diocese | Topog. | Topography or Topographi- cal |
| Rot. Cur. Reg. . . | Rotuli Curiae Regis | Trans. | Transactions |
| Rut. | Rutland | Transl. | Translation |
| | | Treas. | Treasury or Treasurer |
| | | Trin. | Trinity Term |
| Sarum | Salisbury diocese | | |
| Ser. | Series | Univ. | University |
| Sess. R. | Sessions Rolls | | |
| Shrews. | Shrewsbury | Valor Eccl. (Rec. | Valor Ecclesiasticus (Record Com.) Commission) |
| Shrops. | Shropshire | Vet. Mon. | Vetusta Monumenta |
| Soc. | Society | V.C.H. | Victoria County History |
| Soc. Antiq. | Society of Antiquaries | Vic. | Victoria |
| Somers. | Somerset | vol. | Volume |
| Somers. Ho. . . . | Somerset House | | |
| S.P. Dom. | State Papers Domestic | Warw. | Warwickshire or Warwick |
| Staff. | Staffordshire | Westm. | Westminster |
| Star Chamb. Proc. | Star Chamber Proceedings | Westmld. | Westmorland |
| Stat. | Statute | Will. | William |
| Steph. | Stephen | Wilts. | Wiltshire |
| Subs. R. | Subsidy Rolls | Winton. | Winchester diocese |
| Suff. | Suffolk | Worc. | Worcestershire or Worcester |
| Surr. | Surrey | | |
| Suss. | Sussex | Yorks | Yorkshire |
| Surv. of Ch. Liv- ings (Lamb.) or (Chan.) | Surveys of Church Livings (Lambeth) or (Chancery) | | |

A HISTORY OF
CORNWALL



51° 15' 40' 50' 45' 51°

EXPLANATION OF COLOURING

RECENT

- Blown Sand
- Alluvium

PERMIAN

- Breccia and Sandstone

CARBONIFEROUS

- Upper Culm
- Middle Culm
- Lower Culm

DEVONIAN

- Devonian Red Sandstone

SILURIAN

- Barnes Series
- Upper Silurian

ERUPTIVE

- Greenstone (Dabur, Epidiorite etc.)
- Gabbro
- Elian Dykes
- Granite (Folite, near Plymouth)





30

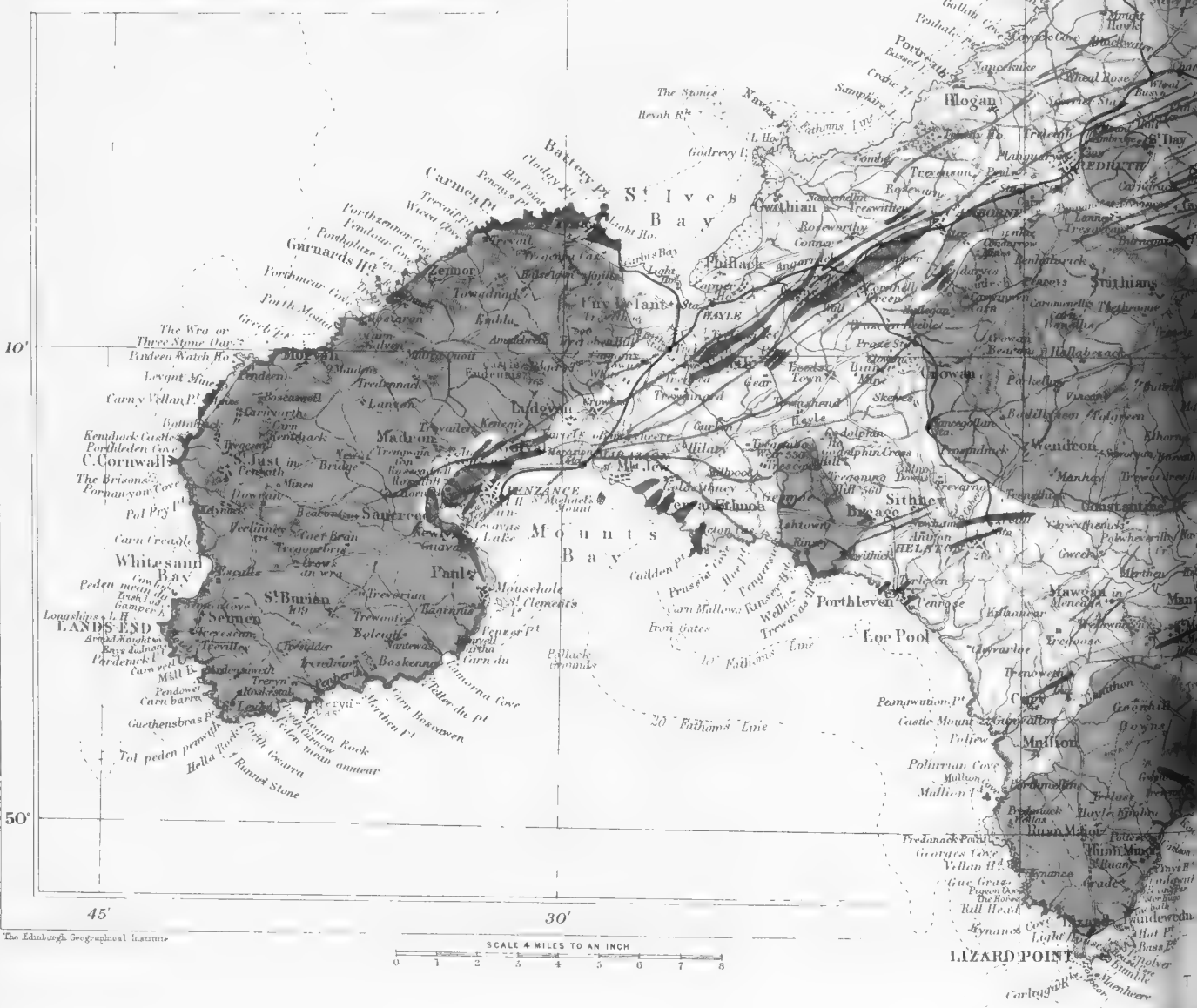
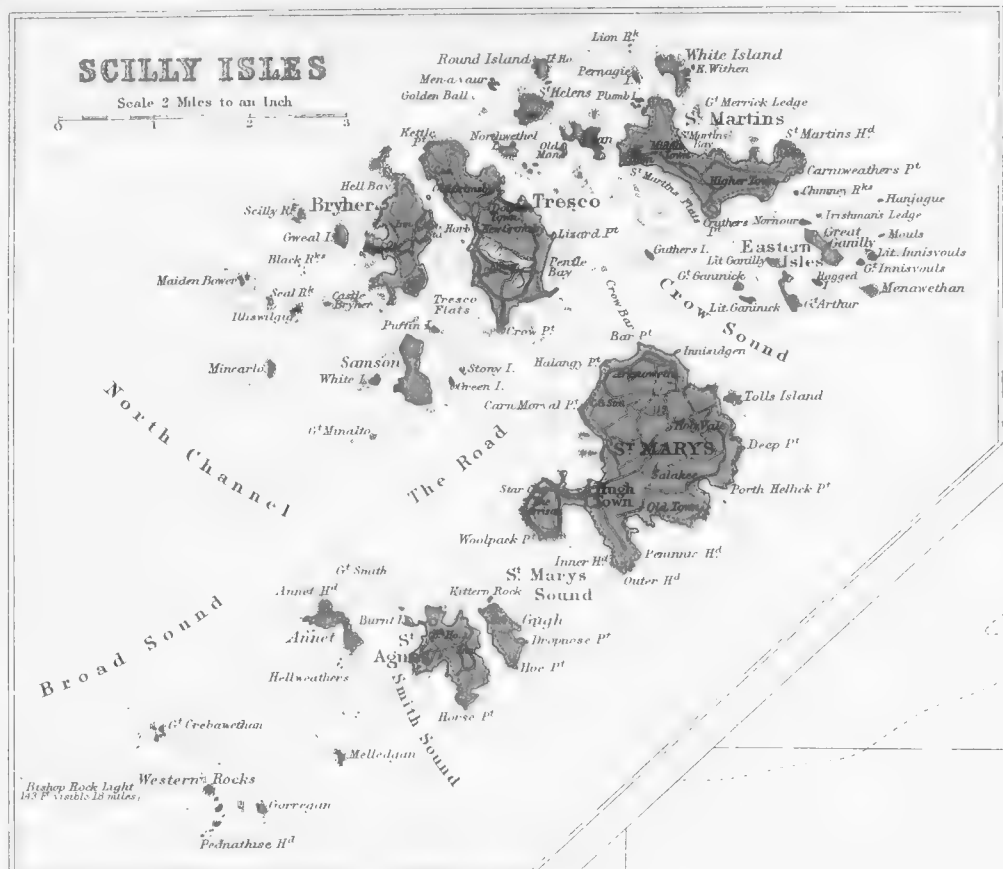
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SCALE 4 MILES TO AN INCH

THE VICTORIA HISTORY OF THE COUNTIES OF ENGLAND





GEOLOGY

THE county of Cornwall, jutting out to the western seas as a long spur, forms part of a narrowing promontory that culminates in a claw, the extremities of which, known as the Land's End and the Lizard, constitute respectively the most westerly and southerly confines of Britain ; while the Scillies, yet further to the south-west, stand out of the Atlantic as its islet prolongation.

Its extensive seaboard, forming a line of bold cliffs facing the seas of the Bristol and English Channels, and exposed to the full fury of the Atlantic breakers, presents a coastal scenery unique amongst the English counties ; while its extreme western walls, which overlook the Atlantic, exhibit a beauty and grandeur that attract alike the lover of the picturesque and the student of nature. While the problems opened up by the study of our rock formations have possessed a fascination for the scientific investigator from the earliest days of geological science, the mineral products contained within their recesses claimed the attention of observers at a period far more remote, and brought to our shores the merchants of ancient Phœnicia. From the earliest times which history records up to the present day the extraction of tin has, with intervals of cessation, formed a staple industry of the county. In later times, when the stream deposits no longer yielded an adequate supply, the extension of this industry to subterranean sources and the extraction of other useful metals from these underground workings opened up a wider field ; the growth of these industries brought in its train more systematic observation which probably gave birth to the science of geology as related to Cornwall. Those observations and the speculations to which they gave rise have been continued to the present day, and the county can boast of a long roll of Cornish geologists whose publications have amassed a voluminous literature extending over two centuries.

Their observations have been supplemented by scientific investigators attracted hither from outside the county and beyond the seas. Of those able and enthusiastic pioneers, Sir Henry De la Beche, the founder and first director of the Geological Survey, stands out pre-eminent, not only from his masterly observations in the field, but from the concrete form in which he embodied them together with the scientific results of the distinguished observers who preceded him. His classic memoir constitutes a landmark in Cornish and even British geology.¹ Notwith-

¹ *Report on the Geology of Cornwall, Devon and West Somerset* [with Bibliography, 1602-1837], 1839.

A HISTORY OF CORNWALL

standing the lapse of over sixty years since the publication of that report, during which the science of geology, then in its infancy, has advanced with rapid strides, the observations and deductions recorded in its pages have needed so little modification at the hands of subsequent observers, equipped with more modern methods, as to afford the most eloquent testimony to the accuracy of his facts and the soundness of his reasoning. The bibliography of Cornish geology is so extensive that it would be impossible within the compass of this treatise to do it justice.¹ Those indeed who are at present engaged in these investigations suffer from an embarrassment of riches, so that it is no small task for the geologist of to-day to ascertain the facts that have been gleaned by former observers in the same field. The Geological Survey is at present engaged on a more detailed examination of the county, and in the official publications which will follow, the extent of their obligations to the labours of others will be adequately acknowledged.

Before dealing with the successive processes of nature's operations which have evolved the present configuration of our county, it may be stated at the outset that the rocks which enter into its geology belong to the earlier chapters of geological history, and form the natural foundations on which the strata of central and eastern England have been laid down. Moreover in the vast interval of time since their formation they have suffered profound alteration, and the pages of their history are not easily deciphered. Not only so, but the very changes which have altered the rocks to the condition in which we see them to-day were themselves brought about in a long distant geological epoch, the antiquity of which exceeds that of the most lofty mountain chains of Europe.

Before inquiring therefore into the history of those ancient periods which gave rise to our rock formations, it will be convenient to take note of the changes that are going on at the present day within the ken of our own observation. For although the solid rocks of the county are of vast antiquity, its physical features and the present relation of land and sea, mark the final results of continuous agencies of change, the operations of which, though apparently slow, are yet taking place before our own eyes. Moreover it must not be understood that finality has been attained, for the changes in the past which have evolved the scenery of to-day are still going on, ever modifying to some extent the features inland and along the coast.

While the surface of the county is covered by a mantle of vegetation, save where our granite tors protrude their wild and fantastic eminences, and the rocky wastes break the continuity of the fertile pastures of the lower lands, the coast forms a line of cliffs steep and bare which almost girds the county. This dissected line affords us a series of sections of the great rocky platform which forms the mainland of Cornwall, and which otherwise is so much concealed by the materials of its own decay as to be largely beyond the limits of our observation.

¹ For List of Works on the Geology of Cornwall to 1873, see W. Whitaker, *Journ. Roy. Inst. Cornwall*, No. xvi. 1875.

GEOLOGY

That great platform, stretching seawards and presenting to the Atlantic solid ramparts of lofty cliff, appears to withstand the constant assaults of the sea without sustaining any damage. But in spite of the obduracy of these bold headlands we know, from the effects of wave-action on softer strata, that, though imperceptibly, they must be slowly losing ground. It has been calculated that a single roller of the Atlantic ground swell (20 feet high) falls with a pressure of about a ton on every square foot ; but the winter breakers often exert a pressure of over three tons to the square foot, so that the cumulative momentum that our coast is called upon to withstand is indeed enormous. If the projecting headlands reveal small traces of the ravages made upon them by the sea, the bays, notwithstanding their more sheltered situation, readily betray their losses. While the former plunge steeply beneath the water, the softer rocks which form the bays are lined by a succession of beaches, from the platforms of which we can study the effects of wave action. It is evident from the most cursory examination of the cliff-foot that our seaboard is undergoing a slow but constant modification. The debris from the cliff which accumulates at its base is shifted by tide action, and in times of storm is hurled by the sea against the rock face from which it was detached. While this process rounds the fragments, and finally reduces them to the condition of gravel and sand, the cliff itself is gradually being undermined by the incessant pounding, and furnishes a further supply of debris, which in its turn, brought within the action of the waves, occasions a repetition of the process, and the sand and shingle so produced are still further assorted and spread on the sea floor by the action of tide and current. Not only is the cliff eroded along its base, but blocks of rock are frequently detached by the loosening of their joints due to the disintegrating action of the weather, such as rain and frost.

This debris, if permitted to remain, would act as a shield against the continued waste of the cliff, but the moment it comes within range of the waves it is utilized as an instrument of further destruction. That the gradual fretting back of our shores is a fact to be reckoned with is apparent to dwellers on the coast. During the last quarter of a century within the experience of the author, the foot-paths skirting the shores of Gerran's Bay have been gradually removed inland by the landslips along the edge of the cliff consequent on the undermining of its base ; and at the present time rents are still visible along the edge, the certain precursors of future landslips ; while large slices of the cliff are still to be seen which have not yet subsided to its base. The picturesque caverns which are so common along our seaboard are in themselves testimonies to the degradation of our coasts ; lines of weakness in the rock having, through the action of the waves, been enlarged to a wide opening.

The mutual relation of our bays and headlands to the character of the rock formations is nowhere better expressed than in the termination of the great headlands which enclose Mounts Bay. The bay is

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hollowed out of a district mainly composed of slate, while the great promontories by which it is flanked are built up of hard igneous rock ; that of the Land's End being composed of a boss of granite, the outer limits of which approximately conform to the coastline, while that of the Lizard, which constitutes the opposite spur, consists of igneous rocks the dominant member of which is serpentine. The relation of these hard and tough rocks to the softer slates is expressed not only in the configuration of cape and inlet, but the elevation of the cliffs shows similar correspondence, the cliffs of Mounts Bay being dwarfed by the more imposing mural faces of the Land's End and Lizard promontories. The granite of the Land's End, presenting a vertical wall to the Atlantic, forms the most impressive scenery ; while the serpentine, which enters so largely into the geology of the Lizard, breaks up into the most picturesque coast, the charm of which is enhanced by the natural polish induced by the action of the waves on that singularly beautiful rock.

Our Cornish rivers, although frequently winding along deep valleys, are small and of low gradient ; in fact their declivity is so slight that their erosive powers on the valleys they traverse is now insignificant. It is a matter of common observation however that after rains they are not only swollen and more rapid, but the usually pellucid stream is turbid with the sediment borne along in its current to the muddy flats of the tidal estuaries on which it is deposited ; the force of the current being then so materially checked that none but the very finest material is capable of being held in suspension to be carried to the deeper water of the sea. If our river system therefore exerts but slight erosive powers on the drainage basins which it occupies, it is evident that it plays an important part in transporting the washings of the soil to the sea. That the amount of material thus removed is by no means unimportant is testified by the rapid silting up of the tidal estuaries. In our harbours dredging is necessary to counteract such shallowing, while in some of the narrower creeks the silting up process is so rapid that the fact is familiar to dwellers upon their banks. At Restronguet ships could ride at anchor considerably farther up the creek within the memory of men living, while the mud-flats of the river Fal below Ardevora are creeping rapidly seaward at a rate which is apparent to observation. Tradition avers that this estuary formerly extended inland as far as Tregoney, which was an important Roman settlement accessible to shipping. The Fal estuary is of especial interest as the tidal flats, instead of being banks of dark brown mud derived from the decomposition of the slates, consist of pale tenacious clay brought down from the surface of the western portion of the St. Austell granite mass. That mass being in a highly decomposed condition readily lends itself to the process of denudation, in striking contrast to the neighbouring slates, which in comparison disintegrate slowly, so that the material deposited in the estuary is made up mainly of impure kaolin from the deposits of that district, considerably augmented by the drainage of the

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waste water from the china clay works. This deposit is being utilized for the manufacture of bricks and the coarser class of earthenware.

The vast amount of material thus collected in our estuaries and spread out on the sea floor to mingle with the deposits derived from the disintegration of the coast, is the product of the denudation of our slopes by the action of rain. The wash of the soil from steep slopes to their base is familiar to the farmer, who periodically collects the accumulations of the lower ground and respreads them on the denuded land to preserve its fertility; operations which entail considerable toil. While we are apt to regard the functions of rain from a standpoint of irrigation, its mechanical action is largely lost sight of. In the extensive valley system into which Cornwall is broken up, such mechanical action has the fullest play. While the floors of our valleys are lined deeply with loam or clay, the converging slopes are more sparingly covered with a mantle of soil, among which stony fragments are abundantly interspersed. In extreme cases the sides of the valleys contain stretches of ground in which soil is altogether absent and the bare rock protrudes. It requires indeed little observation to discern a very close relationship between the depths of our soils and the surface configuration, our low-lying basins supporting the deepest deposits, while on the slopes which converge to them the depth of the underlying rock depends upon the angle of slope, so that very steep situations are barren in consequence of the entire absence of soil. This varying soil cap, due to the form of the ground, produces marked divergence in the agricultural value of the land, apart from the nature of the parent rock from which the soil has been derived. While the *richness* of the soil depends upon the ever-varying nature of the rock, the *quantity* of soil dependent upon physical situation is a factor of equal importance in its bearing on the fertility of the county. The perpetual creep of the soil to lower levels is well illustrated in some of our upland valleys, where alluvial basins have been so encroached upon by the downward creep that their ancient margins have been completely obliterated. The stream-tin valley of Porkellis in the parish of Wendron is fringed with gentle slopes in which the granite is completely hidden by a soil-cap made up of its own disintegration, and corresponding precisely with the granite alluvium which floors the valley; and the one shades imperceptibly into the other. The high ground in Cornwall occupied by the granite presents frequent instances of basins in which the original flat is gradually being obliterated by the soil creep from the slopes. Some of the moors which so frequently occur at the head of our valleys have thus been formed. Largely composed of clay, the want of fall renders drainage difficult, and their bottoms are frequently lined with marshes. Being on this account unsuitable for cultivation they are given over to scrub and gorse and afford coverts for game, just as many of the rocky slopes in the granite districts consist of moorland stretches, clothed with gorse and bracken, the recesses of which form the congenial haunts of the fox.

Large tracts on the seaboard of Cornwall owe their existence to the

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direct action of wind, and form extensive sand dunes and towans. These aeolian deposits are most strongly developed on the northern coast, where large areas are permanently cut off from the operations of the plough. The most considerable of these fronts St. Ives Bay, forming the Lelant, Phillack, Upton, Gwithian and Godrevy towans. Another extensive tract constitutes the Perran Sands, and isolated patches continue as far as Newquay. Further to the north the solid rocks forming the promontory of Trevoze Head are severed by the towans extending from Constantine Bay to Perleze Bay, and opposite Padstow a tract of sandhills extends from St. Michael to the Dunbar. Smaller patches occur at Gunwalloe and along the southern coast.

These accumulations of sand are mainly composed of finely comminuted sea shells, such as form our shelly beaches, and have been largely utilized in Cornwall for enriching the soil by the lime contained in their composition. The sandhills now occupying such extensive tracts rest on the solid rocks and have been formed by the beach detritus driven landwards by the wind. The sands, ever on the move, have piled up deposits which have overwhelmed ancient buildings, the most noted instances of which are the old churches of Perranzabuloe, St. Enodoc and St. Constantine. The spread of these sand drifts is considerably checked by the vegetation which they support, but the dunes are continually receiving fresh accession of material by the windborne sand from the coast, which is blown considerably beyond their limits.

Mr. Clement Reid, F.R.S., has described other effects seen at Carbis Bay during gusty E.N.E. winds in the year 1900, from a height of 270 feet above the sea, where swirls and puffs of dust were observed to rise from the flat at the entrance of the Red river to a height of at least 240 feet, blotting out Godrevy towans and Godrevy lighthouse, and then spreading in a well defined belt across St. Ives Bay for over 3 miles in the direction of St. Ives Head, which it must have passed. He suggested that the dust, largely composed of the river-mud, might account for some local falls of 'red rain.'¹

The modifications which the outlines of our county are at present undergoing have now been briefly touched upon. Under the influence of tide and current the shore materials are continually being assorted, while in some instances they have formed barriers behind which the seaward passage of the river-borne detritus has been checked. At Loe Pool for instance, below Helston, a beach has been piled up by the Atlantic breakers and has dammed back a considerable freshwater lake. The similar lake of Swanpool near Falmouth likewise owes its existence to the beach thrown up across the mouth of the valley. Our exact observation of the submarine floor is necessarily confined to that portion of its innermost margin which is laid bare between tidemarks. The incessant changes of the bottom beyond that zone are exemplified by the salvage operations at present being carried on in Mounts Bay on the wreck of the *Anson*, a ship of war lost a century ago. The shifting of the shingle on the

¹ *Nature*, lxx. 414.

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wreck is such that one moment the deck is bare and the guns visible, only in a very short interval to be completely reburied beneath the gravel. But the Hydrographical Survey furnishes us with an accurate chart of the sea floor, and in many instances with the nature of the deposits which line it. We thus know that our Cornish promontory emerges from a broad submarine plain, which, gradually deepening westward, far beyond the coast of Ireland, is suddenly truncated by a great submarine steep, which plunges into the abysmal depths of the Atlantic. On the inner fringe of this submarine plain the debris of our Cornish land is being assorted. These accumulations are steadily receiving fresh accession of material and are growing at the expense of the dry land; and we cannot escape the conclusion that the fretting back of our coasts, assisted by the denudation of the interior, must, if unchecked, eventually involve the complete removal of the county below the surface of the waves. Far distant as such an epoch must be, the interval would represent a small proportion of the time that has elapsed since our rock formations were deposited. If the present rate of degradation were continued for a million years, our county would in all probability be reduced to a group of islands, mainly composed of granite, which rearing their crests above the sea would still yield a dogged resistance to its ravages, as the Scilly Isles do to-day.

The examination of our Cornish coast not only teaches us that the county is silently crumbling away before the insidious advances of the sea, but brings us face to face with a more mysterious factor, the past operations of which, if repeated in the future, may either turn the tide of war in favour of the land, or by acting in alliance with the sea may hasten the time of its ultimate destruction. When we see that ancient forests on the one hand fringe our coasts beneath the limits of our lowest tides; and when on the other hand we find the remains of former beaches above the level of the highest tides, it is evident that the sea is operating on an unstable coast, subject to vertical oscillations, by which its destructive powers are controlled. The causes of these crustal movements do not immediately concern us in the present sketch, as they are the effects of subterranean agencies on which we can but speculate; but the results of such oscillations, and the actual knowledge of the instability of the earth's crust, are concrete facts which underlie the elucidation of the complex architecture of the rocky platform which forms our county.¹

So far back as the year 1757 the submarine forest of Mounts Bay was noted by the Rev. W. Borlase, and was subsequently described by Dr. Boase in the year 1822. The latter represents it as buried beneath deposits of sand and gravel, the removal of which by the sea is constantly laying it bare—the outward prolongation of the vegetable bed extending beneath the sea. Between Penzance and Newlyn he notes a bed of vegetable

¹ See W. A. E. Ussher on 'The Recent Geology of Cornwall' (articles reprinted from the *Geol. Mag.*), 1879; and *The Post-Tertiary Geology of Cornwall* (printed for private circulation), 1879.

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remains reposing on the sand, the relics of a wood mainly composed of hazel, and to a smaller extent of alder, elm and oak ; while hazel-nuts and the remains of insects, especially of beetles, are abundantly preserved.

A small portion of a submarine forest occurs at Millendreth Bay near Looe. Another at Maen Porth to the south-west of Falmouth has been described by the Rev. Canon Rogers, who observed the stump of an oak in its position of growth with peaty material enclosing its roots and containing the remains of the common yellow flag (*Iris pseudacorus*) still flourishing in the adjoining swamp.¹ He also noticed the remains of a submarine forest with stumps of oaks and willows in their original situations a little above the level of low water at Porthleven near Helston. Mr. Nicholas Whitley has described another at Porthmellin. In the Hayle estuary, the Dunbar Sands at the mouth of the canal at Perran Porth, Lower St. Columb Porth, Mawgan Porth, and numerous other localities, traces of submarine forests also occur. In 1898 we observed a tree stump detached from its original position on Pendower beach in Gerrans Bay, indicating a submarine forest in that vicinity.

The subsidence of the land which these forest beds imply is confirmed by the evidence of the deposits which line the mouths of our estuaries. The search for stream-tin has been the means of dissecting these accumulations below the level of the sea, both at Restronguet Creek and at Pentuan, where remains of a forest growth in its natural position are buried beneath an accumulation of deposits exceeding 50 feet in thickness, which overlies the stream tin. At Pentuan, Mr. Colenso, in 1829, found roots of the oak in their natural position at the base of this deposit with oyster shells still fastened to some of the stumps. These were overlain by a stratum of dark silt, about a foot in thickness, on the top of which was spread a layer of like extent formed of the leaves of trees, hazel nuts, sticks and moss, the moss in a perfect state of preservation, and affording evidence of having grown in the position where it was found. This latter layer occurred at a depth of about 30 feet below the level of low water, and supported a stratum 10 feet thick sprinkled with wood, hazel nuts, together with the bones and horns of deer, oxen, etc. ; and shells of the same species as those which now exist in the neighbouring sea arranged in layers in such a position as to suggest that the animals lived and died where their remains were found. In an overlying bed of sand, 20 feet in thickness, were the remains of trees lying in all directions, together with the relics of red deer, and the bones of whales. This in its turn was overlain by another bed of sand and gravel 20 feet thick, which extended to the surface. On the upper portion of the superficial layer, on the level with the low water at spring tides, were found the remains of a row of wooden piles, apparently used in the construction of a footbridge, which, if correct, would imply a subsidence of the land since that portion of the human era when man had reached the stage capable of such construction.

¹ In the submerged forest at Maen Porth Mr. Samuel Roberts discovered the horns of a deer at present in the possession of Mr. Robert Fox of Falmouth.

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The sections of the Carnon stream works in the valley which opens from the head of Restronguet Creek, as described by Mr. Edward Smith in 1817, and by Mr. Henwood some twenty-five years later, confirm the evidence at Pentuan of the burial of forest growths beneath the level of the sea. Moreover both these observers record the occurrence of human skulls, together with animal remains, principally of the deer, at a depth of over 50 feet beneath the surface. Sir Henry De la Beche mentions also that 'at Pentuan human skulls are stated to have been found under about 40 feet of detrital accumulations, also mingled with the remains of deer, oxen, hogs and whales.'

Assuming therefore that the forest bed noted at Pentuan $52\frac{1}{2}$ feet below the surface corresponds to the similar deposit at Carnon, with human skulls 53 feet beneath the surface, then, as Sir H. De la Beche has pointed out, 'a considerable change took place in the relative levels of sea and land since man inhabited Cornwall, allowing estuary or marine deposits to be effected in creeks upon a surface that previously permitted the growth of terrestrial vegetation, the remains of the marine creatures entombed in the mud, silt, or sand, showing that these creatures were of the same species as those which now exist in the adjoining sea.'

The ancient beaches which fringe the Cornish coast were laid down in the Pleistocene seas, and now form ledges extending from only a few feet above the present sea level to a height of 65 feet. A beach at the latter elevation, according to Mr. Clement Reid, 'the highest raised beach yet discovered in Cornwall,' is seen in Penlee quarry, near Newlyn, where coarse beach-shingle rests on a rocky shelf 65 feet above ordnance datum. The old cliff and beach can be traced at about this level through Penzance, and sweeping round Mounts Bay behind the marshes.' Among the more noteworthy of these beaches are those which occur near Newquay and Godrevy, at St. Ives, Cape Cornwall, Coverack Cove, Falmouth Bay and Gerrans Bay. So long ago as 1758 Borlase described the deposit south of Cape Cornwall, although it is not actually certain that he grasped its significance to the extent of recognizing it as an ancient beach. In 1828 Mr. Carne indicated their occurrence at various localities along the cliffs of western Cornwall. In 1832 Mr. R. W. Fox, F.R.S., described the raised beaches of Falmouth Bay, as forming a bed of rounded quartz pebbles, gravel and sand, resembling that of the present coast, and from 9 to 12 feet above high water mark.¹ In the same year their frequent occurrence along the Cornish coast was noticed by Dr. Boase, who considered that in maximum height they did not exceed 50 feet above sea level, and sloped from that point beneath the sea just as our present shore does. 'Thus also,' he observes, 'the beds of gravel and sand at Fistral and Gerrans Bay, and elsewhere, exhibit the same phenomena, the lower part of these sometimes touching the waves, and at others appearing on the cliffs resting on the rock far above the present sea-level.'²

These raised beaches, composed of material identical with that of

¹ *Trans. Geol. Soc. of Cornwall*, iv. 468.

² *Phil. Mag. and Journal of Science*, Dec. 1832.

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their modern counterparts, are frequently cemented by oxide of iron, which has so consolidated them, that they have sometimes been utilized as building stone. In this condition they offer great resistance to the action of the waves, as is well seen in Gerrans Bay on the beach of Pendower. In some instances along the coast the ancient caves of the raised beach have been partially preserved by the old beach floor being sufficiently consolidated to form the roof of modern caves, which have been excavated in a lower portion of the same cleft, examples of which are seen in Falmouth Bay. De la Beche has figured such a cave at Porthalla, roofed by a raised beach. This consolidation is interesting as an example of rock building.

Even on the coast line where beaches are absent, a tiny fringe of gravel is often visible. It may be observed along some of the steeper cliffs, its preservation being obviously due to the durability of the cementing material, which has not only held the particles together, but has firmly bound the gravel to the rock on which it rests.

Every gradation is seen between well defined beaches and mere shreds of gravel either cemented or incoherent occurring in isolated strips above the present high water mark ; and the degradation of them causes the commingling on the modern beach of the Pleistocene pebbles with those of recent origin. The beaches of either age contain, in addition to fragmental material representing the detritus of the adjacent rock formations, numerous foreign pebbles, mainly chalk flints and cherts, which in some situations are profusely distributed. At Cape Cornwall Mr. Reid discovered a pebble closely resembling one of the volcanic rocks of Devonshire. These erratics have either been swept around the coast by current action, or have been derived from a deposit more ancient than the raised beach which fringes our coast beneath the level of the sea. The modern beach which lines the shore fronting Loe Pool is thickly strewn with these erratics.

In some instances the rock shelf, planed by wave action, along our modern shore has been shaped from the rocky platform previously excavated by the Pleistocene seas. This is well seen in Falmouth Bay, at Sunny Cove, where the ancient platform standing but 5 or 6 feet above the present eroded shelf is fringed along the coastal notch by the innermost edges of the older beach, averaging but a foot or so in thickness, which have not yet succumbed to the ravages of the waves.

Looking at that section in which the rock terraces are so closely placed that the shingle of the present beach is driven against its ancient counterpart, with the disintegrated pebbles of which it absolutely mingles, it is difficult to realize the great interval of time which marks the gap between the past and present shore line. Yet that span has been sufficient for the sinking of the land to a depth of at least 60 feet, involving the submergence of the woodland which flourished on its outer fringe. Moreover the valleys thus invaded by the sea have been converted into estuaries which have subsequently been filled with deposits to a depth of 50 feet. In addition, the upheaval which has left

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these terraces in their present position has often materially changed the geographical features ; for instance, the present peninsula of St. Anthony in Roseland, above two miles in length, was before the uprise an island, as is demonstrated by the deposits of sand charged with marine shells on the neck of the peninsula ; while the peninsula of Pendennis, forming the opposite front of the entrance to the Falmouth estuary, has similarly emerged from the sea which completely encircled it.

The antiquity of these old beaches is still further borne out by their frequently being overlain by the material which has long been known in Cornwall, and to geologists generally, as 'head.' It is sometimes stratified, and may contain beds of sand and fairly rounded gravel ; more often however the tendency to stratification is but slight, and it presents an irregular accumulation of stones, mostly angular, occasionally subangular. Such an accumulation is made up of material similar to the subsoil of the district. If this subsoil were transported from higher to lower levels it would probably form a deposit similar to the so-called 'head,' which often merges so gradually into the subsoil as not to be separable from it. That the surface burden which forms the subsoil is ever creeping to lower levels may be seen in the sections afforded by the Cornish lanes, along the steeper valley slopes, where their banks have been cut through soil and subsoil into the solid rock. In these banks, no matter in what direction the lower strata are dipping, the upper surface invariably bends down the hill, the downward drag of the superficial accumulations involving the solid rock in its creep. The action of rain-wash in the passage of debris to lower levels has already been alluded to, but it is evident that modern processes are not evolving the tumultuous and stratified accumulations of 'head' such as are common features along the sea front, and have acted as a protective covering to the raised beaches. An explanation must be sought elsewhere.

In Pleistocene times the whole of Britain, except its highest peaks, as far south as the Bristol Channel, was probably buried beneath a mantle of ice, and during these arctic conditions the face of the country was profoundly modified by the grinding effects of the glaciers which over-rode it. While nowhere in Cornwall is there evidence of the county having been invaded by that ice cap, its proximity to the edge of the ice field must necessarily have entailed the rigours of an arctic climate, under which the land was incapable of supporting any but the sparsest vegetation. In winter, not only would the higher ground be swathed beneath a covering of snow, but the crumbling *débris* which so deeply covers our slopes would be frozen for many feet below the surface. The melting of the winter snows and the ice which bound the frozen soil, acting on a surface unchecked by vegetation, would involve a sweeping of material down the slopes that would amply account for the abnormal character of that deposit. In its downward course it has filled the hollows on the coast line and covered the shelf of the ancient beach to which it has afforded a protection, so that the thickest deposits of

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'head' are found in the smaller bays by the filling of which the shore line has been modified. Some writers have considered the 'head' to have been formed beneath the sea, but the phenomena which it presents can be more satisfactorily accounted for on the above hypothesis. That the outer edge of the deposit reached the sea may be regarded as certain, and it is even probable that in sheltered situations it might creep out beneath the water and escape destruction from tidal action ; but the seaward creep on the ocean front must have been limited by the zone of wave action before which the advancing deposit was progressively truncated and its contents spread on the sea floor.

That the raised beach which underlies the 'head' was formed at least before the close of the glacial epoch seems all the more probable from the evidence furnished by other districts. On the northern side of the Bristol Channel for instance, Mr. R. H. Tiddeman has shown that the raised beach of Gower is overlain by glacial deposits ; while still further north the west of Scotland affords ample evidence of the glacial age of some of the raised beaches of that region.

The gap therefore that divides the raised beaches of Cornwall from their modern counterparts, with which at first sight they almost appear to blend, is not only represented by periods in which the land has undergone considerable oscillations of level, but marks a period that carries us back to the glacial age. In that prolonged interval, the earliest part of which was marked by an arctic climate, Palæolithic man inhabited Britain in association with giant forms of extinct mammalia, such as the mammoth and the gigantic Irish elk, and with the cave-bear, lion, rhinoceros, lynx, leopard, hippopotamus and reindeer. The presence of herds of herbivorous animals which browsed upon the pastures, implies the continental condition of Britain, permitting their migration across the plain now occupied by the eastern portions of the English Channel. Subsequent submergence which followed the age of great forests brought back once more the return of Britain to its present insular condition. Although, except in one instance which will be referred to later, the remains of Palæolithic man and the extinct mammalia coeval with his existence in Britain have not hitherto been found in Cornwall, owing in all probability to the absence of limestone caverns, and deep deposits of peat and gravels from which such remains have usually been disinterred, it may be taken for granted that our county was the habitat of early man and his congeners. His remains however, as already noted, are stated to have been discovered in association with the remains of deer and other animals beneath 53 feet of estuarine deposits at Carnon and beneath 40 feet of similar material at Pentuan. These however would probably be referred to the Neolithic period. Mr. Clement Reid and Mrs. Reid have recently discovered at Prah Sands between the head and the raised beach an old land-surface, consisting of loamy soil penetrated by small roots and containing fragments of charcoal and bone. Pieces of vein-quartz also occur and appear to have been used as implements. Mr. Reid regards these remains as the first record of palæolithic man in Cornwall.

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The Pleistocene age, in which flourished several forms of mammalia some of which are now extinct, together with the subsequent interval, make up the Quaternary period. By far the larger portion of the Quaternary deposits has been spread out on the submarine shelf that fringes the coast, a tract which the mutability of events may eventually convert into a future land surface. The preceding Tertiary period, by reason of its greater antiquity, has been subjected to a far longer experience of crustal oscillation, in which sufficient time has been afforded for those more ancient accumulations, together with such portions of the submarine shelf on which they were deposited, to be gradually upheaved ; so that a considerable area of the Cornish platform of to-day marks the site of the bed of the Tertiary seas, while the few marine accumulations of those seas that have survived the long period of denudation since their emergence from the ocean floor, yield unequivocal testimony to the vast changes in the past in which the boundaries of land and sea have taken part.

The rigorous conditions of the glacial epoch were preceded by periods of subtropical climate, which characterized the Miocene age. The interval between these two extremes, in which climatal conditions represented a temperate zone, constitutes the Pliocene period, the youngest division of the Tertiary strata. Although these deposits present a very general resemblance to the beds at present being formed on our littoral, the shells which they enclose are not confined to species that now inhabit our seas, but include forms which at the present time find their habitat in the more northern and more southern seas. Not only do the fossil remains reflect the transitional conditions which connected the climatal extremes already alluded to, but a large proportion of the species which flourished in the Pliocene seas have become extinct.

The only deposits in Cornwall which can with certainty be referred to the Pliocene period occur in the neighbourhood of St. Erth, occupying a very small area, and probably owe their preservation to the protection afforded them by their physical situation.

The discovery of this small relic of the Pliocene shelf is very recent, and was brought about by the deepening of a clay pit which revealed shells in the subjacent clay bed. The deposits, which are covered by a few feet of head, consist of brown, blue and mottled clays, loam, sand and gravel, but the beds change very rapidly, so that adjoining sections present a different sequence. They have yielded numerous species of mollusca and other invertebrata, together with microscopic forms of life represented by the foraminifera.

The marine shells were first described by Mr. Whitley, and subsequently studied by Messrs. S. V. Wood, Robert Bell, and P. F. Kendall, while Mr. Fortescue Millett has been engaged in the investigation of the foraminifera. Finally the beds have been studied by Mr. Clement Reid, who discovered another outlier of these Pliocene deposits on the ridge north of Cannon's Town, at an elevation of 150 feet, in which the fossiliferous clays of St. Erth are missing. Mr. Reid considers that the

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fossiliferous clays were formed in a depth of water extending to 40 or 50 fathoms, an estimate confirmed by his recent discovery of the ancient shore line of the Pliocene sea at a height of about 420 feet above the present sea level.

Another outlier, which has been referred by Sir Henry De la Beche to the Tertiary period, had been previously described in 1832 by Mr. John Hawkins and Dr. Boase. This deposit, which occurs at St. Agnes Beacon, and reaches, according to the latter writer, a height of 375 feet, consists of sands and clays which up to the present have not yielded determinable fossil remains. Like the St. Erth beds they exhibit rapid variation, and it is probable that they may also be the products of the Pliocene sea which Mr. Reid has shown to have exceeded even that elevation. Mr. Thomas Clark of Truro has recently found a shell fragment in the clay of this deposit, but too imperfect for identification.

On Crousa Downs an isolated patch of gravel, consisting of rounded quartz pebbles, occupies, according to Sir H. De la Beche, an area of about half a square mile, at a height of about 360 feet above the level of the sea. The origin of this deposit is wrapped in obscurity, but its correspondence in elevation to the sands and gravels of St. Agnes Beacon suggests that it may also be of corresponding age.

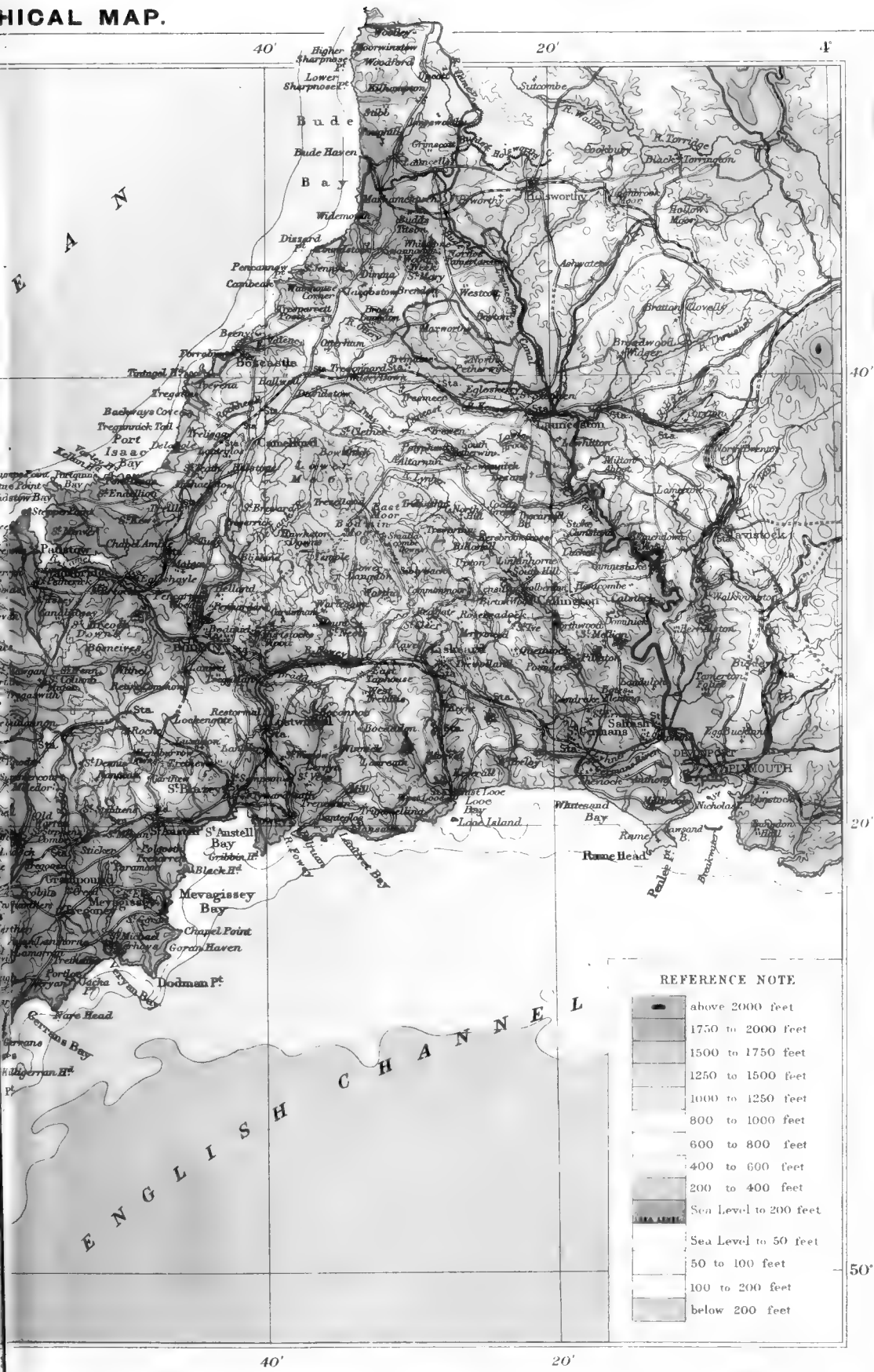
Notwithstanding the paucity of those Pliocene deposits which have survived the denudation of the subsequent ages, sufficient have remained to enable us to restore in imagination the physical features of the period to which they relate. The seas then covered large portions of the present land surface of Cornwall, and if we could restore the geography of the Pliocene period we should see an archipelago where Cornwall now stands, while the Isles of Scilly would lie beneath the waves.

While the Tertiary history of Cornwall is obscure, our knowledge being confined to those few isolated deposits all of which probably represent events in the more recent division known as Pliocene, it was preceded by the stupendous gap which extends over the Mesozoic ages, during which was accumulated the succession of Secondary deposits that constitutes the geology of the greater part of England. In that interval were laid down the older Tertiary deposits forming the London and Hampshire basins, the foreign equivalents of which have been involved in the structure of the European mountains, and the fauna and flora of which ushered in our present species of animal and plant life. The great depression of Cretaceous times permitted the slow accumulation of our Chalk formation from the tiny remains of foraminifera. The still older Jurassic system, with its divisions of the Lias and Oolite, forms a broad band which crosses England from sea to sea; and yet earlier the older Mesozoic period evolved the great formations of the Trias and Permian.

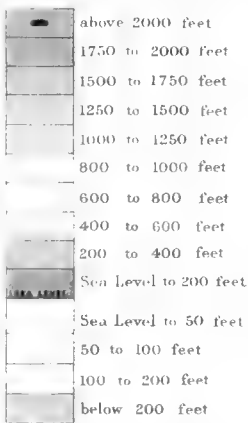
Of the millions of years that occupied the building of these formations which represent the incoming and extinction of many forms



PHICAL MAP.



REFERENCE NOTE



J O Bartholomew

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of life that tenanted the seas and lands of those remote epochs, the records of our county are silent. Whether those deposits ever extended westward on to the Cornish platform can scarcely be conjectured. That their absence in Cornwall does not negative their former presence in the west, we have had recently a vivid object lesson in the Isle of Arran, where the preservation of Mesozoic fragments in the vent of an old Tertiary volcano constitutes the sole record of the ancient extension of Rhætic, Liassic, and Upper Cretaceous strata to the basin of the Clyde.

But the rocks which enter into the geology of Cornwall differ from the later Mesozoic formations not only in antiquity but in character. The traveller who journeys by rail from London to the west passes over the Tertiary and Mesozoic formations, the character of which is admirably brought out by the various cuttings which dissect them. As far west as the river Teign in Devonshire the strata, in spite of the most marked variations, preserve a general uniform facies in striking contrast to the character of the cuttings seen for the remainder of the journey west of that river. The sections to the east reveal soft strata, succeeded by beds which, although more coherent, rarely present the same massive section as those met with west of that river, which are distinguished by their greater appearance of solidity. This change of strata is accompanied by the most marked change in the character of the scenery, the broad plains and more gentle undulations of the east being replaced by a bolder landscape, which has given rise to an extensive system of deep valleys that have been spanned by the numerous viaducts which form such conspicuous objects of the Cornish railway. In that westward journey we have been passing progressively across the various geological formations that occupy the interval between the Pliocene deposits of Cornwall and the Palæozoic formations upon which they are reposing; commencing with the older Tertiaries of the London basin, succeeded by the Cretaceous, Jurassic, and Triassic formations, which are finally replaced in south Devon by the Permian, so well seen in the red sandstones and conglomerates that form the cliffs at Teignmouth. Those red beds rest on the Palæozoic formations, which extend into Cornwall and almost monopolize the geology of the county; and as remarked in an early part of this chapter these older rocks form the natural foundations on which the strata of central and eastern England have been laid down. The successive deposits, originally horizontal, have been tilted by crustal movements, so that in our western journey we pass over the truncated edges of great piles of strata, getting gradually lower in the series, just as we might walk over the upper edges of a pile of inclined slabs.

The peculiarities which have given the Palæozoic formations of south-western England their marked character, especially their indurated condition, were induced on these formations before the Mesozoic epoch, as the Triassic and Permian deposits which have been partly made up of their detritus amply testify.

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Before describing the various formations which compose the Palæozoic system of Cornwall it will be convenient to give a brief description of the general structural features, which have imposed on them their present aspect. This will be more appropriate at this juncture as the geological phenomena to be described are posterior to the formation of the youngest member of the series; and the chronological sequence we have adopted in tracing the course of our history from the events of to-day back to the remote past will not be departed from.

From the description of the more recent deposits which we have already given it will be seen that the submarine platform from which Cornwall stands out has been subjected in the past to repeated oscillations, so that the sea-floor of one epoch has formed the dry land of another, moreover the rocky platform of Cornwall itself constitutes, as regards large areas, ancient sea-floors which have emerged from beneath the waves. By these undulatory movements the adjacent boundaries of land and sea have ever been shifting their position. When it is considered that the Pliocene shore line has been found at an elevation of 420 feet, and that the period which separates us from that landmark, in spite of its longevity, is but a fraction of the profound span which extends back to Palæozoic times, it will require no strain on the imagination to realize that the sediments accumulated beneath the seas of the more distant epoch form the main ingredients which enter into the composition of the Cornish platform.

Although these Palæozoic sediments present but little resemblance to the more recent deposits which rest upon them, and to the detritus now being accumulated on our littoral fringe, they are nevertheless to a great extent their counterparts, laid down in bygone geological periods, and thereafter subjected to a series of vicissitudes that have brought about metamorphic changes in their character. The 'killas' of Cornwall, in spite of superinduced structures which largely mask its original condition, is seen to contain alternating layers of gravel, sand and mud similar to those which are observed in our recent deposits. Moreover, preserved within the strata are the fossil remains of the marine life that flourished in those ancient seas, but of types essentially different from our modern fauna; while beds of limestone charged with fossils are the result of organic accumulations in clear water free from the invasion of sediment. In other words the rocks which enter so largely into the geological architecture of Cornwall belong to an early chapter in the history of that marine plain or great littoral fringe when its boundaries differed widely from those of to-day. Commingled however with the sediments we find the products of volcanic action in the remains of lava streams and ashes, which having been emitted on the sea-floor have been sealed beneath the overlying accumulation. Under the influence of crustal movements the Palæozoic deposits with their volcanic beds have gradually subsided, and have been buried beneath a deep pile of overlying strata. So great has been their downward movement that they have been brought within the influence of the great laboratory that lies

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beneath the crust. In those subterranean regions they have not only had to support a pile of superincumbent strata, but have been subjected to a vast amount of mechanical deformation by the operation of powerful earth stresses. Under the influence of pressure the incoherent particles which enter into the composition of the sediments have been compacted into solid rock. On these rocks the earth movements have produced structural modifications which have not only affected the individual beds, but also the material of which they are composed. In response to lateral pressure the strata have been bent and doubled back one over another and thrown into a set of folds closely packed together; and finally have obtained relief from the strains by actual disruption.

Of the mechanical changes which these rocks have undergone, the most conspicuous is undoubtedly the production of cleavage planes, which by their action on the indurated muds have evolved the slates, the quarrying of which has formed a staple Cornish industry for at least three hundred years. Carew in 1602 described the blue roofing slates of Cornwall as 'in substance thinne, in colour faire, in waight light, in lasting strong, and generally carrieth so good regard, as (besides the supply for home provision) great store is yeerely conveyed by shipping both to other parts of the realme, and also beyond the seas, into Britaine and Netherland.' The compression to which the strata have been subjected has resulted in the production of planes of fissility along directions at right angles to the direction of pressure. These cleavage planes, have been among the last mechanical changes effected by the lateral strains in response to the earth stresses; they are usually of regular character, and form a close array of parallel planes which traverse the strata, independent of the original stratification and to some extent of the folding in which that stratification has been involved. Although bearing no relation to the original bedding, their disposition in regard to the flexures is more defined, as the cleavage planes show a marked tendency to lie parallel with the axes of the folds. When the material which has been cleaved was originally a pure clay of uniform consistency, the result has been a perfect roofing slate in which the earlier structures of stratification and folding have been either completely obliterated or preserved as bands, only to be distinguished by slight variations in colour. Instead however of this homogeneous character so favourable for the formation of slate adapted for economic purposes, these Palæozoic deposits are mostly of heterogeneous composition, the cleavage of which exhibits marked variations, so that the slate that can be wrought as an article of commerce is restricted to limited areas.

The 'killas' of Cornwall being largely made up of alternating bands of diverse texture, its compression in lieu of effecting a uniform cleavage has produced a complex set of structures, the elucidation of which requires much patient and minute investigation. Where cleavage for instance has been set up in alternating layers strongly contrasted, such as shale and sandstone, the common type in fact which the coasts of Falmouth Bay and Gerrans Bay exhibit, the cleavage planes

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change their character according to the nature of the layer which they traverse. Those which cross the slate are not only more numerous than those which traverse the sandstone, but incline at different angles ; so that two shale bands which are divided by a sandstone display parallel cleavage, but this parallelism is broken in the interposing sandstone. Moreover if the latter is sufficiently massive it has resisted cleavage altogether, so that we see the phenomena of cleavage in perfect parallelism as regards the upper and lower members while it is absolutely severed by a band in which this structure is wanting. As the sandy beds present every gradation in their texture, there are corresponding gradations in the degree of fissility which they exhibit. Another factor which constitutes a disturbing element and still further varies the cleavage, is the disruption of the rocks—the fractures produced having acted as planes of relief bringing about a cessation of the stresses in their neighbourhood—so that beds of similar strength present different degrees of fissility. In studying the effects of cleavage on the Cornish strata the fact must be borne constantly in mind that flexure, fracture and cleavage are intimately related, and express different phases in the history of their deformation by the same stresses. The coast sections already alluded to display marked variation in the degree of deformation both as regards the intensity of folding and the nature of the fissility in strata of similar lithological type.

While the cleavage has resulted merely in the flattening of the component particles of the strata, as illustrated by the distortion of the fossils, the rearrangement of our 'killas' formations does not always stop at this comparatively simple process, but the crushing to which they have been subjected has set up interstitial movements. These movements resolve themselves into a succession of small slips along the cleavage planes, and have often been sufficiently severe to set up a transverse cleavage on their own account ; the latter in many cases so well developed as to form the dominant cleavage of the rock, and in its turn to have acted as planes for further interstitial movements.

In response to lateral pressure the strata have been folded, the folds have been closely packed together, bringing their limbs into a general parallelism, so that no further relief from pressure is to be obtained by plication. But the strength of the rock sometimes fails before the stresses which still continue to bear, and rupture occurs. The fractures still follow the disposition of the folds, and snap their arches, the planes so formed allowing one part of the mass to override that which adjoins it. So that the folding stage has been replaced by a phase of fracture which takes the form of thrusts by which individual segments are pushed forward. The reversed faults so formed are known as thrusts, to distinguish them from normal faults, in which the ruptured rock segments have dropped downwards.

While the strata on the large scale have been thus modified, their component particles have been undergoing on the small scale precisely the same process which has set up interstitial movements. The individual

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layers which form the beds have been thrown into a set of minute folds, the arches of which have been broken by tiny cleavage planes which resolve themselves into miniature faults, and there is the same tendency to override that we see in the larger divisions of the beds. On examination the rock is frequently seen to be full of these little folds and thrust planes, with a disposition to a secondary cleavage, while minor movement planes appear in the more resisting core itself, with accompanying strain-slip cleavage ; and the cleavage planes which pass through the axes of the minute folds often culminate in small thrusts.

But besides the structures we have enumerated, these crushing processes acting on heterogeneous strata have produced in Cornwall a set of widely distributed breccias which closely simulate the coarser products of erosion. These breccias or pseudo-conglomerates are well developed on the western side of the Carrick Roads, in a belt that extends from Feock to Falmouth and is broken by the estuaries which form the creeks of Penryn, Mylor and Restrouguet, along the shores of which they may be conveniently studied.

They consist of slate fragments enclosed within the strata ranging from the size of peas up to 5 or 6 inches in length, with their flat sides lying in more or less parallel planes. As a rule the larger fragments are angular, while the smaller are sub-angular and may sometimes be perfectly rounded. They may consist of either argillaceous or siliceous material, and are identical in composition with the matrix of the slate in which they are enveloped, and from which they have been obviously derived. Instead however of being water-worn as their appearance suggests they owe their origin to agencies very much more complex, and represent a phase of those processes of deformation to which we have drawn attention, so that instead of being an original structure of the rock, they present a most striking record of its subsequent deformation. The Mylor beds, in which these phenomena are best displayed, are made up of dark blue argillaceous and fine quartzose beds which succeed one another in such thin alternations that the strata are conspicuously striped. The changing nature of these interlamina-tions, and the corresponding variation in their limits of compression, have resulted in different degrees of resistance to the crustal movements ; the softer beds having easily yielded, while the more resistant strata, separated from each other by bands which are beginning to yield, and being thus deprived of support, are smashed, and the fragments become involved in the more yielding mass. Under the influence of these movements the particles not only become detached from the parent rock, but are frequently rolled in the process and simulate pebbles. If we endeavour to trace the normal laminated beds into the fragmental or brecciated type, we see that the former gradually lose their regular appearance, and become affected by small folds and thrusts, until at last they are nothing more than a mass of segments more or less detached, and it becomes

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apparent that the breccia has originated in little overfolds which have been isolated by small thrust faults. Although direct evidence of this origin is not always forthcoming, we occasionally see, step by step, every process in the manufacture, beginning with a regular banded rock, followed by minute folding and small thrust planes, partially severing the bands, until at last these processes have not only succeeded in brecciating the rock, but have culminated in the rolling and rounding of the fragments to such an extent that a pseudo-conglomerate has been produced.

This type of brecciation has sometimes been brought about without folding; instead of fractures succeeding plication, the stresses have resulted in the direct production of movement planes, which have isolated the fragments from the main mass.

These pseudo-conglomerates are not confined to that restricted area in which they are so prominent, but are met with over many parts of the county. At Rosemullion a bed of this nature 2 or 3 feet in thickness bears a striking resemblance to a boulder bed; the fragments, which may attain a length of 3 inches, are rounded, and consist of hard sandy material precisely similar to the matrix in which they are embedded.

In the Vryan area this structure is noticed close to the junction of the slate and quartzite of that district. In one of the bands of brecciated slate we observed a crinoid stem, apparently unbroken, unmistakable evidence that the rock, as a whole, may undergo considerable deformation, while portions may escape, probably as a result of the very violence of the processes which have produced zones of fracture relieving the strains on intermediate material.

A brecciated structure of a much coarser type, which severs the continuity of thick seams of rock, occurs on the coast section south of the Helford river. Beyond that horizon the 'killas,' which consists of blue slates and fine sandy beds of the same type which occurs in Gerran's Bay and Falmouth Bay, has suffered more severely from the stresses which have induced the folding and the cleavage of the rocks. At Dennis Head the structures set up by these movements have been carried a step further. The strata have been subjected to crushing or mylonitization of a coarse type, insomuch that they have been reduced to a mass of coarse lenticular patches of rock, the lenticles being several feet, in some cases several yards, across, the whole presenting the character of a regional breccia. These lenticles, when they have been torn from quartzose beds, resemble huge boulders; in other places the apex of a folded limb has been detached and isolated from the parent mass. This extremely coarse type of brecciated structure is more or less continuous along the coast as far as Porthalla, where the northern edge of the Lizard 'complex' appears.

The quartzite which occurs a little inland above the cliff, south of Nare Point, is represented on the shore by a lenticle about 10 feet long and 5 or 6 feet wide, having been isolated by these movements from the parent mass. While earth stresses have so deformed

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the rocks as to interfere with the continuity of individual seams as in this quartzite, the same causes have in other cases produced quite an opposite effect ; for instance, the quartzite at Carne, which on the coast of Gerrans Bay below is only a few feet thick, has been so intensely folded that it occupies a considerable area on the hillside above, and presents the appearance of a bed of considerable thickness. In this case the quartzite has been folded, and the folds so packed together that a narrow bed has been made to occupy a considerable outcrop, while on the other hand the quartzite south of Nare Point (St. Keverne) has been so squeezed and dislocated that it is only represented by a series of lenticles. A small quartzite band that occurs in the Falmouth estuary presents similar features. On the coast between Restronguet Point and Porthgidden this quartzite seam 1 or 2 feet thick is represented by a series of lenticles among the folded and brecciated slates in which it occurs.

The belt of country which is bounded by the coast line extending from Gerrans Bay to the Helford river includes so many estuaries, which penetrate far into the heart of the county, that the tortuous and extensive coast line presents every facility for studying the rock structures. As this area includes several sedimentary divisions and every variety of deformation, a summary of its structural characteristics will convey a very fair idea of the processes of rock-building to which the Palæozoic deposits of Cornwall have been subjected, as the result of their sojourn in the subterranean depths of the earth's crust.

A detailed study of those coast sections reveals a complex set of structures, which have been brought about by powerful earth stresses. Folds may be detected immediately in any of the sedimentary divisions, but as the folds are generally isoclinal (closely packed) the plication is not so conspicuous as in a region of normal folding. But the evidence of plication is everywhere so marked that the apparent dip of the strata can only be interpreted as the inclination of limbs of folds. The folding has been accompanied by faults which are almost as numerous as the folds to which they bear a direct relation.

The faults often occur every few yards, both parallel to the strike (or trend of the beds) and in oblique directions, with the result that the whole rock-mass when seen in ground plan presents the appearance of a huge mosaic. On that part of the coast with which we are now dealing neither large faults nor large folds are common. It would appear that at an early stage of the folding process the resistance to the strains was so feeble that fractures were readily produced. In many districts reversed faults are as numerous as those of normal type.

Although the rocks are everywhere cleaved we can in most cases on the south coast distinguish between the cleavage and bedding. The alternations from argillaceous to arenaceous material are so numerous that there is little difficulty in distinguishing these structures. The cleavage which is usually oblique to the bedding varies with the nature of the

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material it traverses, and is always deflected in crossing from an argillaceous to an arenaceous bed, and vice versa.

The slates on this part of the south coast have a prevailing southeasterly hade, both in bedding and cleavage. By bedding should be understood the lithological alternations due to original stratification, which in most cases along the coast section represent the limbs of folds. Where these are regular in their hade, and the cleavage is uniform, the section may present such an undisturbed appearance that the folding might easily be overlooked. Where the folding follows the normal type it can be readily detected, but the amount of compression of the strata is often far less than when the folding is isoclinal, and the evidence of this is not so apparent. The obliquity between the cleavage and bedding is not constant. As the cleavage and folding have both been brought about by the same agencies, we see every variation depending on the character and curve of the fold, and the obliquity of the cleavage to the bedding will often vary over the different portions of the fold. Although we may often see the cleavage transverse to the bedding, the general tendency has been for the beds to be thrown into a set of isoclinal folds with a definite general hade, and for the cleavage to cross somewhat obliquely at a low angle. The more the folds depart from this general hade, the greater will be the variations between cleavage and bedding. Besides cleavage the slates are traversed by other structural planes analogous to those found in schistose rocks, and this is especially noticeable where they are made up of alternations of varying material. For not only have these composite beds been more readily acted upon owing to the less uniform resistance they have offered to pressure, but their banded appearance reveals the structures which in slate of more homogeneous material cannot be so readily detected. On examination we often, as already noted, find the rock full of tiny folds and thrusts, the latter passing through the axes of the former, while the secondary cleavages are often as prominent as the dominant cleavage of the beds.

While it will be readily understood that under the influence of pressure the sands and muds of the Palæozoic seas have been indurated and changed to the condition which is generally known in Cornwall as 'killas'—which along the coastline presents a rocky shore in striking contrast to the material of the beaches which fringe it—the rock which has been referred to as quartzite is so markedly different in character that a word or so is necessary in explanation. The sandstone beds within the killas are built up from the aggregation of quartz grains, together with felspathic, and even argillaceous material, while scales of mica from original deposition are commonly distributed. Instead of this heterogeneous mixture the quartzite consists of quartz grains among which other ingredients are but sparingly distributed. In the depths of the earth this purely siliceous deposit has been welded by pressure into a rock of uniform type corresponding to the uniformity of its ingredients,

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and as the quartz which forms the grains is the hardest of the common rock-forming minerals, the rock which has been evolved from the welding of those grains is of exceptional strength. The compacting of the grains by pressure has been accompanied by the filling of their inter-spaces with a deposit of silica, which has acted as a cement and has been precipitated chemically from heated waters.

The killas is traversed by veins of white quartz which not only occupy planes of fissure but ramify in all directions amongst the rock masses. The amount of quartz so distributed is enormous, and to its destruction we owe the greater part of the shingle on our beaches. This siliceous rock formed no part of the original marine deposit, but has originated at a subsequent period during the subterranean phase of the Palæozoic formations in which it is enclosed. In those depths the formations have been more or less saturated with thermal waters which circulate beneath the surface. As rocks are not absolutely impervious the entire mass was constantly searched and subjected to a process of leaching. The repeated passage of heated waters over every particle of the entire rock mass removed silica in solution and redeposited it by chemical precipitation along lines of fissure, which are the main channels to which such waters ultimately converge. Notwithstanding the marked contrast which exists between the 'killas' and the quartz veins, the silica of which the latter are entirely composed enters so largely into the composition of the killas either in the pure mineral of the quartz grains, or in chemical combination with other substances, as to form more than half of the total material of the rock mass, so that the chemical relations of the veins and enclosing rocks are of the closest nature.

These veins moreover are not all of the same age. While some have participated in the flexure and brecciation to which the 'killas' has been subjected, others are undisturbed and have evidently been formed at a period when the movements had ceased.

The downward digression of that pile of marine accumulations of the ancient Palæozoic seas not only involved them in the disturbances of the terrestrial crust represented by their mechanical deformation already described, but brought them in close proximity to those great subterranean furnaces, the home of vulcanism, the presence of which is often so painfully manifested by the effects of volcanic action.

In that subterranean region the Palæozoic deposits have been invaded by enormous masses of molten rock, which have produced extensive alteration on the killas within their vicinity, carrying their metamorphism a stage further, whereby the slates have been converted into schists of such an advanced stage of crystallization, that in some cases the sedimentary deposits formed on the sea floor have been confounded with the products of volcanic eruption.

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While subsequent upheaval followed by denudation has afforded us the opportunity of studying the sea bottoms of those ancient periods, it has also laid bare for our inspection the subterranean regions of volcanic energy. The deeper seated magmas, the cooling of which occupied long periods of time, are represented in Cornwall by the extensive masses of granite which enter so largely into the geology of the county. But besides the granite which forms a series of bosses along the watershed and constitutes the most elevated portions of the area, smaller intrusions of igneous material have been forced into the killas as sills and dykes, that are represented by the greenstones, mica traps and elvans.

In discussing these various products of igneous intrusion sealed up within the killas, priority naturally attaches to the granite from its greater superficial extent, and the important position it occupies as the seat of the staple industries of the county ; in the raising of metal, stone and clay, both as regards the granite itself and the killas which flanks its margins.

The granite which comes to the surface in Cornwall resolves itself into five well marked bosses, along a line which approximates to the central axis of the county. To the north-east lies the Brown Willy mass which extends over Bodmin Moors ; the Hensbarrow granite forms a somewhat smaller boss in the neighbourhood of St. Austell ; and west of the Falmouth estuary the Carn Menelez granite, with its two outliers of Carnbrea and Carnmarth, occupies an extensive ring within the limits of Falmouth, Helston and Camborne. Another large mass forms the western peninsula of Cornwall extending from St. Ives to the Land's End ; while the fifth mass constitutes the Isles of Scilly. Of the smaller granite patches are those of St. Michael's Mount, and Tregonning and Godolphin Hills, those of Carnbrea and Carnmarth already noticed, Cligga Point (near St. Agnes), Castle-an-Dinas and Belovely Beacon (near St. Colomb Major and Roche), Kit Hill and Hingston Down (near Callington), and other minor intrusions in close proximity to the larger masses. The granites vary considerably in texture, but their mineral composition is so closely allied that we are driven to the conclusion that the various individual bosses derived their material from a common source of supply.

Mining operations have demonstrated the underground connection of the granites of Carnbrea and Carn Menelez. Similarly the smaller patches which occasionally flank the larger bosses are in all probability united below ground with the main mass. From this reasoning it might be inferred that if we could strip off the overlying killas the larger granite masses would be similarly connected ; but in spite of their close petrological relationship these larger bosses have acquired a marked individuality both as regards their texture and the distribution of their chemical contents. It would appear therefore that each of these bosses marks the site of individual eruptive centres, the materials of which have been derived from a common magma at lower depths. Moreover, although

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their upper surfaces appear to be domes, it is by no means unlikely that they are huge laccolites, which have been forced laterally between the strata under somewhat similar conditions to the smaller injections which constitute the greenstone sills. Further, although derived from the same magma basin they may differ widely in geological age.

Of these five larger bosses the Carn Menezes granite occupies the central position. As it is also the chief seat of the Cornish granite industry, as well as our most important mining centre, its composition and structure will be more particularly described, and the remaining granite masses will be touched upon later in so far as they depart from this type. In the Carn Menezes granite we shall include the two adjacent patches of Carnbrea and Carnmarth which are in such close contiguity as to lie within the same eruptive centre.

This mass may be described as a grey and coarse textured granite consisting of orthoclase and plagioclase feldspar, abundant quartz and both black and white mica, together with tourmaline in varying proportions. Lithia mica is a common constituent in parts of this granite. Porphyritic feldspars are commonly distributed, and include individuals of idiomorphic orthoclase exhibiting twinning of the Carlsbad type. Andalusite and topaz are of rare occurrence. Although not so coarse as some of the other Cornish granites, which contain porphyritic crystals of large size, like those of the Land's End type or of the mass near St. Austell, yet the Carn Menezes rock presents a texture which, as compared with other British granites, is not only coarse as regards the matrix, but also in the size of its porphyritic feldspars, which are often 2 or 3 inches in length. While both muscovite and biotite are usually present, every variation may be observed in their relative abundance. In some localities muscovite may occur almost to the exclusion of the biotite, while in others the mica may be almost entirely of the latter variety. Tourmaline is usually brown, sometimes blue and rarely green, and it occurs both as a constituent of the ground mass, in which it generally takes the form of stumpy prisms, and as a later introduction coating the faces of joint planes in needle-shaped crystals, which tend to dispose themselves in bunches, and sometimes attain a length of 2 or 3 inches. Tourmaline seems to be a conspicuous mineral in the more acid portions of the granite which vein the normal type. In some veins of coarse acid granite tourmaline occurs to the exclusion of biotite, and some of the individuals noted under these conditions are as large as half an inch in length. Where such coarse acid veins have been observed to contain tourmaline as well as massive schorl, contiguous veins which are finer in texture are found to be rich in biotite, with tourmaline entirely absent. In the coarse veins containing tourmaline the mica that occurs is muscovite, and other instances have been observed where the mica of the coarse acid veins is confined to the white variety. Although no sharp change of texture constituting a chilled margin has been noticed at the outer edges of this granite, yet if the mass be regarded on the large scale, the marginal portions are often finer grained than the interior, contain a larger proportion

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of biotite, frequently to the almost entire exclusion of white mica, and are heavier than the coarser grained material, so much so as to affect its commercial value. This increased specific gravity (about 1 per cent) is no doubt due to differentiation in the mass prior to consolidation by the concentration of the basic oxides to the cooler peripheral portions.

Although this granite mass here and there shows veining of its evenly-textured material, by granite much finer in grain, more especially perhaps in the parish of Wendron, the evidence is clear that such flowage within the mass was effected before final consolidation, and does not represent two generations of granite. The finer veins frequently contain porphyritic feldspars, identical both as regards size and form, with those of the adjoining normal type of granite, while in some instances the veins are so charged with these individuals that the fine-textured ground mass occupies but a subordinate position. Between Bolitho and Boswyn the fine textured granite covers a tract exceeding a square mile.

The Land's End granite is far coarser than the Carn Menezes mass, and includes an area of about seven square miles of fine grained grey biotite granite with small scattered crystals of orthoclase and pinites, which according to Mr. Reid is of later age than the coarse granite into which it has been intruded. Much of the town of Penzance has been built of this stone.

As the Carn Menezes granite is but rarely seen in actual contact with the killas the precise nature of its junction has not been observed, but judging from the margins of the other granite masses of which the coast affords so many examples, there is no reason to doubt that veins protrude from its mass into the adjoining killas. Beautiful examples of such veins are seen on the coast that fringes the Land's End granite mass, as in the vicinity of the Gurnard's Head, Cape Cornwall, Whitsand Cove, at Mousehole, at Trewavas near Porthleven and other localities—and similar phenomena may be seen at St. Michael's Mount.

These intrusions of molten rock have effected profound alteration on the killas into which they have been injected. The Carn Menezes mass presents an aureole of alteration which extends for about 1,000 yards from its margin, the innermost portions of which have been metamorphosed into mica schists crowded with andalusite, while the outer aureole consists of knotted slate. In the latter case mineralization is in the incipient stage, while in the former it is complete, the micas of the schists (both muscovite and biotite) being the products of crystallization, due to chemical action set up by the heated granite mass.

The metamorphic aureole of the Land's End granite is still greater, while metamorphism has been more intense, the sedimentary rocks being indurated and hornfelsed to such an extent that it is often difficult to distinguish these rocks from the greenstones. The difference in area of the two masses is not great, but on the other hand they differ widely in texture, the Land's End mass being much coarser, and the explanation of its greater metamorphic action is to be looked for in its slower cooling.

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This relation of the metamorphic aureole to cooling conditions finds substantial corroboration in the smaller granite mass of Godolphin, the more rapid consolidation of which is seen in its strongly developed chilled edge, while its limits of metamorphism are confined to a few hundred yards. These peculiar zones of metamorphism are sometimes observed where visible granite is absent; Mr. E. Dixon has recorded two such metamorphic areas, one north of Gwinear, the other around Leeds-town, from which we may confidently infer that bodies of granite lie below the surface. Moreover the great elvan region which abuts against the granite at Gwennap contains large areas of spotted slate, but the metamorphism is more feeble than that found bordering the granite mass.

The granite of the Brown Willy district frequently contains large porphyritic crystals of felspar, and is more particularly schorlaceous towards the south.

The granite district of Hensborough or St. Austell is far more variable and more schorlaceous. This granite was described by Dr. Boase and in more recent years by Mr. J. H. Collins. The latter observer alludes to the large size of the porphyritic felspars, and calls attention to veins almost entirely composed of that mineral, while others consist almost exclusively of mica. He also records the occurrence of both lithia and fluorine in the micas of this granite, and the relation which the latter element bears to the decomposition of felspar into kaolin, with which the very existence of our china clay industries is linked. As the industries and minerals of Cornwall will be treated in a separate section it will suffice here to state that china clay and china stone are the products of the decomposition of the granite *in situ*, and that this chemical alteration appears to be mainly brought about by the action of fluoric acid. The relative abundance of fluorine therefore in the original rock mass is probably the determining factor in the production of china clay, and its restriction as regards commercial purity to limited areas. In the Carn Menezes granite for instance the decomposition of its mass rarely yields china stone, and in conjunction with this fact we find an almost entire absence of fluor spar except in association with the mineral veins.

According to Mr. Collins bands of greisen are very frequent in the Hensbarrow granite where decomposed. This mixture of quartz and white mica is common in the Cornish granites, and has in almost all cases been brought about by modification of the granite by subsequent chemical action resulting in the removal of the felspar. The schorlaceous portions of the granite are in many cases the products of a similar alteration but with a different result. The beautiful rock found in detached blocks in the neighbourhood of Luxullian is a variety of tourmaline granite, in which the conversion of a part of its felspar into clear quartz crowded with tourmaline needles has been described in its various stages by Professor Bonney, F.R.S., while brown grains of tourmaline are supposed to represent the mica of the granite. To attempt the

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discussion of the long array of mineral substances which have been produced in the granites and the neighbouring killas by chemical action since the consolidation of the granite, many of which are of economic value and constitute the metalliferous ores, would be beyond the scope of this article. Mr. J. H. Collins has compiled a list of eighty-six minerals that occur in the Hensbarrow granite and in the killas aureole in close proximity.

The granite of the Land's End district is characterized by a general uniformity of texture, notwithstanding the finer grained portions to which attention has been drawn, by the coarseness of that texture exhibited in the large size of its porphyritic feldspars, as well as by the frequent presence of pinite. Schorlaceous granite is a common feature along its northern margin, beautiful varieties being seen in the vicinity of St. Ives, where the larger porphyritic feldspars are replaced by schorl and quartz, in which the original outlines of the feldspars are still preserved. In these pseudomorphs the preservation of the casts of the earlier mineral by retaining its crystalline form, leads to its precise identification notwithstanding the complete removal of its substance.

The granite of the Scilly Islands is usually a somewhat coarser variety in which finer material appears in the form of veins, while schorl is apparently rare.

The granite of Godolphin Hill is variable in type, and according to Dr. Boase is in part extremely rich in feldspar, which acts as a base in which white crystals of feldspar, nodules of clear quartz and black mica are thickly embedded, while schorlaceous veins are common in it.

The granite of St. Michael's Mount is generally fine grained, with a small proportion of mica. The joint planes of this granite often contain quartz, topaz, cassiterite and other minerals, and are bounded by bands of greisen which pass imperceptibly into the granite.

The very slow consolidation of the granite masses has resulted in their complete crystallization. The constituent crystals however have mutually interfered with one another so that they interlock. In the earlier generations of the feldspar represented by the porphyritic forms, we frequently see perfect crystals, while mica and tourmaline likewise occur idiomorphic; the smaller feldspars on the other hand have a less perfect contour, while the quartz which in normal granite has been the last constituent to consolidate has been forced to accommodate itself to the interspaces which remain. When however cavities occur in the rock we find all the various minerals lining their walls in well formed crystals, which are frequently of large size and beauty, especially the purer varieties of silica such as rock crystal, amethyst, etc., while in such situations topaz and other minerals which fall under the category of gems have also been obtained.

Such cavities probably owe their origin to the imprisonment of steam, and in this connection it may be pointed out that the quartz itself which enters into the composition of the granite, and the crystallization of which mineral marks the final consolidation of the rock, contains

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liquid bubbles that move about in tiny cavities, and have resulted from the condensation of steam which such cavities formerly imprisoned.

The system of jointing pertaining to the Carn Menelez granite bears a definite relation to the crystalline arrangement. There are three well defined joint planes ; one set of vertical joints, having a prevalent direction of N.N.W., is crossed by another vertical set at right angles. These two systems, in conjunction with a third set more or less horizontal, divide the whole rock into a set of rough prismatic segments. Such vertical columns of rectangular blocks are admirably displayed by the weathering of the granite in the rugged coast scenery of the Land's End. The rock cleaves most readily along planes parallel to the horizontal joints ; the next easiest cleaving plane is that parallel to the N.N.W. joints, while the rock cleaves most irregularly parallel to the E.N.E. joints. Not only is there a close connection between the major joints and the grain of the rock, but the grain itself is dependent on the internal mineral arrangement, and all these phenomena are closely related. The internal crystalline arrangement appears to consist first in a tendency for the mica to lie with its basal planes horizontal ; secondly, in a disposition of the feldspars, both as constituents of the matrix and as porphyritic individuals, to rest with their flat sides in a similar position ; and thirdly, in the orientation of the feldspars with their long axes parallel to the N.N.W. (cleaving way) joints. The first and second of these structures probably explains the proneness to cleave parallel to the horizontal joints ; while the third seems to show why the rock tends to cleave in planes parallel to the cleaving-way joints.

The uniformity in these structural features is not only diffused over the whole granite mass, but is common to the whole of the post-Carboniferous granites of Cornwall. While the granite presents only exceptionally a marked foliated appearance, it has evidently undergone throughout a rude and initial stage of foliation, whereby its component minerals have been forced to rearrange themselves in a definite direction so as to acquire a cleavage. Judging from the data furnished by the district between Gerrans Bay and Truro, there are reasons for believing that the sediments owe their deformation to stresses acting along a N.N.W. direction which agrees with one of the main cleaving directions of the granite. There are strong grounds therefore for assuming that the granite irruptions and the earth movements are not only closely related, but that the movements had not ceased to operate before the final solidification of the granite. This assumption is still further supported by the evidence of two sills of foliated granite that flank the margin of the Carn Menelez mass near Penryn, and by the foliated or gneissose character of the marginal granite at Kennal Vale near Ponsanooth, the foliation in both instances coinciding with the cleavage of the adjacent slates. A small intrusion of tourmaline-muscovite granite near Truthall is so sheared that the quartz and feldspar are often granulitic with muscovite bent and dragged out.

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The set of major joints which trends approximately E.N.E. corresponds to an extensive system of fissures which have been formed in the granites and Palæozoic rocks of Cornwall by the subterranean disturbances to which the former owe their origin and the latter their deformation. This system of fissures is parallel with the axis of granitic intrusion, and also with the general trend of the elvan dykes and mineral lodes, both of which have taken advantage of the fissures for the introduction of the material that enters into their composition.

These phenomena are well illustrated in the Carn Menelez mass. Within that granite of the Mabe and Constantine districts mineral lodes and elvan dykes are practically absent, while the E.N.E. system of fissuring is almost entirely confined to the visible joints. These joint-faces however frequently display slickensided surfaces which indicate relative displacement of the walls, and are sometimes seen to be small faults that have displaced the horizontal beds of granite to the extent of a few feet. Moreover the finer grained aplite veins tend to take a course parallel to these same joints.

In the parish of Wendron, which forms the central belt of that granite, this E.N.E. fissuring has been so sensibly increased that the stone which is quarried on a large scale in the two former parishes previously mentioned is no longer wrought. With this change elvan dykes make their appearance, also an extremely attenuated set of mineral veins which have been worked for tin; moreover the granite, which is of coarse texture, is extensively veined by finer grained material.

The E.N.E. fissuring is no longer confined to the major joints, but the interspaces between the fissures are very closely fractured along parallel planes. Frequently they consist of tiny cracks which sever the various crystals along their course. In the next stage the cracks have been infilled with quartz, which has been followed by the introduction of schorl as an accompaniment of that mineral, and finally to almost its total exclusion. With the oncoming of wider veins the rock takes on a banded appearance, the black schorlaceous veins standing out in striking contrast to the granite. The schorlaceous veins carry tin, and in some instances it is quite clear that the lode follows the E.N.E. joint. Over the whole district the schorlaceous bands rarely exceed a few inches in width.

When this granite however is followed into the districts of Redruth and Camborne, the magnitude of the fissures and lodes and the extent of the elvans have reached their maximum at that marginal zone of the mass which constitutes the heart of the mineral area of Cornwall.

These E.N.E. fissures, into many of which elvans have been injected, while others have formed the repositories of the mineral ores, especially copper and tin, have been brought about by the volcanic disturbances of the newer Palæozoic periods, whereas the set of transverse fissures, locally known as cross-courses, which have effected vertical displacements of considerable magnitude, are of later date. After a prolonged cessation of volcanic activity, extending over the Mesozoic ages,

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renewed igneous action on a colossal scale broke out in the Tertiary period, producing a new set of fissures of N.N.W. trend. It has left imposing relics in the British Isles, along the line of the Inner Hebrides (Skye, Mull, Rum, etc.) and in the north-east of Ireland, while along its Atlantic prolongation remnants of volcanic activity are still manifested. In Cornwall no igneous rocks connected with this epoch are known to occur, unless we except the phonolite of the Wolf Rock, which may probably be referred to it. But the fissures in connection with the line of disruption extend to regions far removed from the volcanic centres, and we have little hesitation in assigning to that Tertiary epoch the extensive system of fractures known in Cornwall as cross-courses.

The elvan dykes which have been already incidentally alluded to make a conspicuous feature in Cornish geology. Related to the granite by the closest ties of chemical affinity, their difference in mineral composition is mainly one of degree of crystallization. Instead of being restricted to the plutonic phase, involving such slow cooling that the mass is entirely built up of visible crystals, the elvans represent a type of intrusion in which the contents of the subterranean reservoirs have been injected into a series of fissures, forming wall-like masses, the cooling of which has not been sufficiently protracted to admit of so coarse a type of crystallization. As some of them pierce the granite their intrusion must in part at least be referred to a period subsequent to its consolidation, and from their intimate petrological relationship we may confidently infer that both types of intrusion have been derived from a common source of supply.

After their mode of occurrence the most essential particular in which the elvans differ from the granite is the occurrence of a base or matrix in which individual minerals are porphyritically embedded. These minerals are precisely similar to those of the granite. They exhibit however more perfect crystalline shape, and this is particularly illustrated by the quartz crystals. This mineral, instead of forming as in granite irregular shapes among earlier developed minerals, has been free to build up its own type of crystal, viz. a short prism bounded by terminal pyramids. These quartz crystals have often rounded angles which in extreme cases result in their appearance as bleb-like patches without crystalline form.

Not only are there all degrees in the texture of the matrix, but the variation is equally wide in the porphyritic constituents both as regards individual size, number, and the nature of the mineral which is porphyritic. In some cases the porphyritic feldspars are of large size and have been formed in the plutonic magmas from which the elvans have been derived; and there is necessarily every gradation between crystallization of the dyke and plutonic phase, the growth of many crystals having been continuous in both of these conditions.

Although identical minerals occur in both elvan and granite, mica

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is more distinctly predominant, in proportion to the other constituents, in granite than in elvan.

A characteristic feature of the elvans is the tendency for the white mica to assume a radiating or plumose habit, and in the matrix of the rock to combine with the felspar in forming a pegmatitic structure. The granophyric habit is not confined to this type, but pseudo-spherulitic structures have also been noted.

In width the elvans range from a few feet to many yards; a dyke however of abnormal dimensions has been traced following an east and west course through Gwennap, and attaining a width of 150 to 200 yards. Although the elvans are usually very steeply inclined, they exhibit much variation in this respect, and sometimes lie nearly flat. They occur in greatest abundance in districts invaded by granite, although the number that pierce that rock is far inferior to those enclosed by the killas. Occasionally they are found penetrating greenstone, as at Burntcoose in the parish of Gwennap.

Besides the differences we have noted these rocks present great variations in their decomposition, being often represented by a soft clay, as their felspars readily decompose into kaolin. On the other hand the durability of certain elvans is such that they provide some of the best building material which the county possesses.

Their general distribution is noted on the map, from which it will be seen that the greatest departure from their usual trend, parallel to the longitudinal axis of the county, occurs in the elvan system of St. Austell, which follows a course slightly north of west.

The mica traps of Cornwall consist of dyke-like intrusions, the range of which is mainly restricted to a belt of country running north and south between Newquay and Falmouth Bay. This peculiar type of intrusions as related to Cornwall was first described by Mr. J. H. Collins.

Their most characteristic feature in the field is a marked readiness to decompose, so that a fresh surface of the rock is seldom visible, and consequently they have been utilized to a trifling extent as building material. They are usually of a rusty brown colour, and occur as dykes and sills within the slates, not usually continuous for more than short distances. They vary in width from a foot to 50 yards, and have effected a very limited amount of contact alteration on the slates which they traverse. They often exhibit spheroidal structure, cores of more solid rock being encircled by concentric outer layers of exfoliating material; and flow structure is not uncommon, more especially in the finer grained marginal portions. Notwithstanding their advanced state of decomposition, the ground-mass of these rocks can generally be seen to consist of a medium-grained admixture of biotite and felspar, while inclusions of quartz and crystalline felspathic rock are characteristic. These inclusions range to as large as 9 inches and may be rounded,

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or may occur as perfectly rectangular fragments, so that some mica-traps have a brecciated appearance. The rocks thus vary considerably both in texture and composition, and they appear to have been intruded after the slates had been cleft but before the final cessations of the stresses, some of the joints of the sills being parallel to the movement planes in the adjoining slates, while there is a tendency to a parallel structure corresponding with these joints. Moreover the minor dislocations in the slates have heaved the mica traps. The mechanical deformation they have suffered is slight, and is limited to the distortion of the mica, as is rendered evident when they are examined under the microscope. The dominant felspar of these rocks is orthoclase, and augite has been recognized, while a striking characteristic of some of the dykes is the abundance of apatite they contain. They are conspicuously developed in the Fal estuary between Malpas and Mesack Point.

Besides the igneous intrusions represented by granite, elvan and mica trap, the killas has been invaded by another class of volcanic rock more ancient than the foregoing, the products of which are known as Greenstone.

These rocks, although not so widely distributed as the elvans, are not so restricted as the mica traps. Like the former they occur in greatest abundance in the neighbourhood of granite masses, as is particularly emphasized in the western division of the county by the greenstone masses which partly encircle the Land's End and Carn Menelez granites. The intrusive greenstones occur in the form of elongated sill-like masses, and represent the heavier material of the magmatic reservoir. Not only do they contain less felspar than the acid intrusives already described, but that mineral is more commonly plagioclase, the soda variety; quartz has almost disappeared, while the ferro-magnesian constituents are strongly represented.

Hornblende is undoubtedly dominant in the rocks, and the prevailing green colour of this mineral and of its decomposition products has given rise to the name of Greenstone. As these rocks have been involved in the earth movements which have deformed the slates they exhibit various stages of the process of deformation. Moreover their great development within the granite aureoles of contact alteration has involved thermal metamorphism in addition. As the result of these changes the rocks have often been profoundly modified from their original conditions not only as regards structure, but likewise as regards mineral composition.

The researches of Messrs. Allport and Phillips conclusively demonstrate that these intrusions were originally dolerites and basalts in which the augite has been almost entirely replaced by hornblende. While the more massive varieties of the rock which have resisted dynamic metamorphism still retain some of their original felspar, yet the bulk of that mineral is represented by a later generation.

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The greenstones which flank the Carn Menelez granite vary from coarse amphibolites or epidiorites to fine grained rocks of basaltic texture, and from masses which are highly sheared to others which have suffered no mechanical deformation. Microscopic examination leaves no doubt that the coarser masses are altered gabbros, while those of finer texture were for the most part originally basalts. At Bellevue near Penryn the massive amphibolite still retains its original felspar, whereas the augite has been replaced by a mat of actinolite (hornblende), and iron ore is in process of alteration to granular sphene. Near Ponsanooth the rock shows a little foliation, the felspar which is less abundant is mostly in a granulitized condition, and besides some magnetite the rock contains pale brown flakes of mica, probably the direct result of the contact alteration by the granite. The sill between Pengreep and Treviskey is more variable in texture ; while portions are as coarse as that just described, the greater part of the rock is of fine grain. Moreover, as at Devis, the mass has undergone considerable mechanical movement, the finer, more compact zones and those of coarser crystalline condition having been so packed and squeezed together that the coarser portions exhibit shearing. This rock strongly approaches the type of greenstone seen near St. Ives, which has been so profoundly metamorphosed by the granite of that region, and some of its structures recall the banded hornblendic rocks of the Lizard area.

These greenstones may be taken as typical of this class of basic intrusion of Cornwall. While their principal constituents are felspar and hornblende considerable variation is seen in the relative proportions of those constituents. Moreover in the crushed varieties the secondary products may be so widely diffused that the original character of the rock is entirely destroyed.

The intrusive greenstones however are not confined to the basic phase, but rocks of intermediate composition find their place within that group. Both from Newlyn and Flushing greenstones have been determined both by microscopic examination and chemical analysis to belong to the Andesite group. Although these rocks are much altered they have suffered little or no mechanical deformation. The Newlyn rock is unsheared and but little modified ; the felspar is fairly fresh, and the alteration of augite to hornblende is mainly paramorphic. The Flushing rock occurs outside the aureole of granite metamorphism and is more decomposed, the hornblende and biotite being represented by chloritic and serpentinous material.

The varieties which have been metamorphosed into serpentinous products, such as the olivine dolerite of Clicker Tor and the serpentinous greenstone of Duporth, in which also olivine was probably an original constituent, represent an extreme phase of the basic greenstones. Some greenstones occur at Camborne extensively veined by massive garnet, sometimes associated with epidote and pyroxene, all of these minerals having taken their present crystalline form subsequent to the shearing of the rock. Gametiferous greenstones have also been noted in other parts of Cornwall.

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The greenstones therefore have a considerable range in chemical composition, and vary extremely in their mechanical deformation, which is more pronounced in the basic rocks. It may be inferred therefore that the basic have experienced a greater severity of earth stresses than the acid varieties and are consequently of higher antiquity. What period separated the greenstone intrusions from the granites is not evident; but as the granites themselves were subjected to stress prior to final consolidation the whole of these igneous intrusions may have been derived from a common magma. In investigating this genetic relationship however we are confronted with the fact that while some of these rocks retain their original structures, in others they are so far obliterated as to render them useless for comparative study. In so far as the granites and elvans are concerned their affinities are so pronounced that their petrological relationship is obvious. In the case of the greenstones however, both basic and intermediate, we can no longer trust petrological comparisons, but fall back on geological considerations based on the nature and extent of their deformation and mineral alteration, taken in conjunction with their relations to the granite intrusions and to the earth stresses with which we suppose these latter to be linked.

From this point of view the elvans and mica traps are the latest. While the former were intruded when a state of equilibrium had been established, the mica traps appear to have shared in some of the stresses from which the elvans have escaped. The prior granite intrusions consolidated under conditions of stress which induced parallel structures on them. The acid type of greenstone, although demonstrably older than the granite, has suffered comparatively little from earth movements, while the basic forms exhibit variations from types in which the original structure is partially preserved, to others in which it is entirely obliterated.

It is possible therefore that the members of this igneous assemblage may be inter-related and have originated from a common magma. This hypothesis is indeed supported by the fact that it would include a connected series of igneous rocks from basic to acid, which would also represent the order of intrusion.

The ancient Palæozoic ridge of which Cornwall forms a part owes its origin to those earth movements the effects of which have been described, and the final result of which has been to raise the products of the subterranean depths to the surface. From the fact that the deposits were not submerged below that part of the crust known as the zone of fracture, we may assume that the subsidence was confined to a maximum depth of 5 or 6 miles. We have seen that the ancient sedimentary formations have suffered profound alteration by which their original characters are more or less obliterated. In spite however of this metamorphism we can to a large extent decipher their more ancient history. That history covers an enormous span, for notwithstanding a very general

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uniformity which these deposits exhibit as a consequence of their subterranean treatment, the period occupied by their formation may exceed that vast interval which has subsequently elapsed.

For the present we will leave out of consideration the rocks which occupy the Lizard peninsula, which will be treated later. Of the Palæozoic deposits which enter into the rest of the county the Devonian formation undoubtedly takes the most prominent position. Occupying the greater part of Cornwall, it is flanked on the north by the overlying Culm Measures, and on the south by Ordovician rocks, between which are interposed some non-fossiliferous beds, possibly Silurian. As the metamorphism to which these formations have been subjected is more intense in the western portion of the county, the original structures have consequently been better preserved in the eastern part. This difference is expressed in the greater preservation of the original minerals such as augite in the greenstones of east Cornwall, in the identification in the same area of undoubted lava and ash beds, the absence of which in the western region may possibly be explained by their more complete deformation having led to their inclusion with the intrusive greenstones. As regards the killas it may be stated that whereas in the western region the mechanical deformation has reached such an advanced stage that the rock structures are analogous to those of schistose rocks; in the eastern area the process has generally stopped far short of that stage, and the cleavage has been sufficiently uniform to admit of the rock being extensively wrought for slate as in the well known quarries of Delabole. Moreover these differences in metamorphism are accompanied by the most marked divergence in the preservation of organic remains; while the eastern area has yielded fossils in tolerable abundance, albeit in a poor state of preservation, the western district is characterized by their extreme rarity.

The unravelling of the stratigraphical sequence therefore is attended with serious difficulties. For not only have the ancient stratigraphical boundaries been masked by the extensive deformation to which the rocks have been subjected, but their included fossils to which we might otherwise appeal as chronological landmarks have shared in these processes. The better preservation of the fossils in the eastern area has permitted the historical succession of the formations to be more accurately defined than in the west. An inspection of the map will show the southern boundary of the Culm Measures as extending from the vicinity of Boscastle to Horsebridge, which spans the Tamar near the horizon of Tavistock.

The Devonian formation which occurs below the Culm Measures, although tolerably defined in its upper limits by that undulatory boundary, does not admit of such precise definition as regards its base. A zone that traverses the county from St. Austell Bay to Holywell Bay, approximately defines the limits of the lowest Devonian beds which have yielded reliable zonal fossils.

South of that zone the killas is singularly barren of fossil remains

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excepting the narrow strip which forms its eastern margin, where between Mevagissey Bay and Gerrans Bay the grey quartzites yielded to the late Mr. C. W. Peach fossils of Caradoc or Bala age. In the south-westerly prolongation of that zone, which traverses the Meneage peninsula and contains similar lithological types, the quartzites have yielded fossils to Mr. J. H. Collins, while the limestones of both areas enclose fragmental remains of crinoids.

It will be seen therefore that the succession from the Culm Measures (Carboniferous) to the Caradoc (Ordovician) is broken by the geological chapters which separate the latter epoch from the Lower Devonian. The relations which the barren deposits of south-west Cornwall bear to those missing chapters have not been determined. Further, we are not aware of the exact base of the Devonian in Cornwall. Even within the present year Mr. Clement Reid in his examination of the north coast in the vicinity of Newquay has extended the palæontological horizons to lower limits of the Devonian system than hitherto discovered in that locality.

In view of the uncertainties which attend the unravelling of the Palæozoic sequence we have not placed the inquiry in a prominent position, and more especially because the subsequent history of those formations in the subterranean depths has impressed upon our county its dominant geological type. It is therefore on this stage in the building up of Cornwall that we have more particularly dwelt.

In recent years an important advance has been made in the stratigraphy of west Cornwall by Mr. Howard Fox's discovery of radiolarian cherts at Mullion Island in association with lavas of a peculiar pillow or sacklike appearance, an association closely resembling that found to occur in the Arenig beds of the south of Scotland. Moreover Mr. Fox has traced these radiolarian horizons into the Gorran area. Further, in the latter district we have found the pillow lavas of Mullion Island on a similar geological horizon associated with limestone and quartzite; so that the Ordovician age of the Cornish pillow lavas and their associated cherts has been clearly established.

While in the Veryan area these Ordovician beds appear to pass quite conformably into the barren deposits which extend so largely over the south-west of Cornwall, in the Meneage peninsula, their continuity appears to be broken by a conglomerate. That coarse deposit includes pebbles of distantly derived material, which makes it a very important horizon. For not only amongst its contents do we find boulders of quartzite, but amongst its finer detritus the microscope reveals the presence of the pillow lavas. The conglomerate also contains foliated igneous rocks, some of which have certainly been derived from the Lizard area, so that we have in Cornwall at least two periods of metamorphism, one of which is prior to the formation of the conglomerate and its included pebbles of pillow lava, and one later. Of the age of the former we have no evidence, except that it must be pre-Arenig, while the latter is posterior to the Culm Measures.

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The 'killas' which separates the conglomerate of the Meneage district from the fossiliferous Devonian strata of the Newquay district, has been divided into three lithological divisions, viz. the Portscatho series, the Falmouth series and the Mylor series.¹ All these divisions are composed of argillaceous and sandy alternations, and all are characterized by the absence of limestone. Their lithological types are however sufficiently distinct to admit of their being separable on geological maps. The Portscatho and Mylor series are blue and dark in colour; the Portscatho contains the coarser sandstone beds, while the Mylor rocks besides being more shaly are more distinctly banded. The Falmouth series exhibits greater variation, is usually buff in colour, but includes zones which are purple and red. The rocks also appear to be of lesser thickness than either of the two series which they divide. Their occurrence in the Fal basin between Falmouth and Truro in a series of parallel lenticles is an admirable illustration of the geological structure of the county; for although the strata have a general south-easterly dip, and we are apparently crossing the strike from the coast to the heart of the county, yet instead of getting deeper in the stratigraphical series we are on precisely the same geological horizon at Truro as at Falmouth, the intervening ground being made up of a succession of isoclinal folds.

On leaving the barren belt occupied by these rocks we find between Holywell Bay and Boscastle on the north coast, and between St. Austell Bay and the Tamar on the south coast, an assemblage of strata which is not only fossiliferous, but in which limestones occur. The fossil remains with which they are charged leave little doubt that this belt is occupied in the main by Devonian strata, but until the region has been more closely investigated it would be unsafe to assume that an area so folded is entirely restricted to that formation. It is possible that the fine grained conglomerate of Probus and Grampound and the Nare Point conglomerate may represent an unconformity dividing the Silurian and Devonian formations.

As the northern coast of Cornwall truncates the Culm Measures as well as Devonian rocks, while the former are not seen on the south coast, a brief description of the fossiliferous rocks of north Cornwall will sufficiently indicate our knowledge of the palæontological remains that are entombed within the strata.

For the following description of those formations we are indebted to Mr. Howard Fox :—

The rocks of the north coast of Cornwall do not yield fossils in as good a state of preservation as those of the south-east coast and of the South Petherwin beds near Launceston. Between Holywell Bay and Newquay no determinable fossil of interest has as yet been found. At Newquay Mr. Clement Reid has recently collected a considerable num-

¹ J. B. Hill, *Summary of Progress of the Geological Survey for 1898*, p. 97.

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ber of species, though most of them are badly preserved. They include several corals, polyzoa, crinoids, brachiopods, with more rarely *Actinoceras*, *Orthoceras* and trilobites. Mr. C. W. Peach records remains of the Devonian trilobite, *Phacops latifrons*.

North of St. Columb Porth we have a range of $2\frac{1}{2}$ miles of brightly variegated slates, purple, green, buff and grey, similar to those between Fowey and Polperro, the Devonshire counterparts of which have been named by Mr. Ussher the 'Dartmouth and King's Wear Slate Group.' These rocks contain fish-remains. In Watergate Bay the fossiliferous beds are thin and not plentiful. In some beds the fossil scales, spines and plates are abundant, in others more scattered. *Pteraspis cornubica* is one of the most frequent forms and may be reckoned a Lower Devonian fossil. There are occasional fossiliferous beds in Step Cove, the northern boundary of Watergate Bay, in Beacon Cove and Mawgan Porth, but it is not till we reach Bedruthan Steps that we are rewarded with any determinable zonal fossil. Bedruthan is a most interesting locality. Huge blocks are constantly falling from the high cliffs, and some of them come from fossiliferous beds inaccessible to the climber. The coast is open to the Atlantic seas, and these lift the sand and dash it on the rocks, creating such a scour that fresh fossils are weathered out constantly, and the fossil seeker may find a rich treasure when he least expects it. The rocks *in situ* on the foreshore are in certain places crowded with organic remains, a few of which may show good structure and some others may be in a fair state of preservation, though the great majority are indeterminable. The most abundant are corals, crinoids, polyzoa, brachiopods, gastropods, *Orthoceras*, fish remains, with an occasional trilobite and starfish, etc. To this list fragments of a new fossil have lately been found in abundance, which may be looked on as a zonal fossil,¹ *Pteroconus mirus*, Hinde (*Nereitopsis*, Upfield Green). The most perfect specimen is in the British Museum.

Both Samaritan Island and Diggory Island yield fossils, the latter some good examples of *Pleurodictyum*; and ascending Pentire Steps at the north end of the Bedruthan range we pass the bold igneous peninsula of Park Head, and if we descend into Lower Butter Cove may find a *Petraia*, *Conularia*, or fragment of *Pteroconus*, and for certain some crinoidal fragments. There are several distinct fossiliferous horizons at Porth Mear. Trescore Islands and mainland, and Boathouse Cove adjoining, show many fossils, some of which are interesting; amongst others *Phacops latifrons* (?) has been found. Porth Cothan exposes a great surface of blue slate with occasional corals, trilobites and *Conularia*.

Pleurodictyum occurs in Rowan Cove north of Porth Cothan, and northward of that we have found no fossil of value until we reach Constantine Bay and its northern division Booby's Bay, immediately south of Trevoze Head. Here an Upper Devonian fossil, *Cardiola retrostriata*, is found with *Bactrites*, *Zaphrentis*, *Pachypora*, *Phacops*, a brachiopod, *Pleurodictyum*, *Tentaculites*, etc. The fossil however which characterizes the

¹ *Geol. Mag.* decade iv. vol. vii. No. 430, 1900; *Trans. R. Geol. Soc. Corn.* vol. xii. pt. 5, 1900.

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northern end of Constantine Bay is a new species of *Conularia*. It occurs on the surfaces of the shales as nearly black flattened fragments, which often retain the surface markings. In these surface markings this form, according to Dr. Hinde, differs from all the other examples of *Conularia* known from the Devonian rocks of America and Germany, principally in the marked fineness of the transverse lines, and it probably belongs to a new species. There was not a single example of this genus from the Devonian rocks of this country either in the British Natural History Museum or in the Museum in Jermyn Street in 1894, when some specimens were given to them by Dr. Hinde. Two large pyritized forms resembling crustacea 15 to 18 inches long, were found here, one of which is deposited in the Penzance Museum.

The slates on the isthmus of Dinas Head show some organisms, but the chief interest of this projection from Trevoze Head is the exposure of nearly an acre of a soda-felspar rock, weathering white, with a chert-like appearance and fracture, and supposed to be a sedimentary rock altered by contact with the igneous rock of which the peninsula is composed. This rock contains about 10 per cent of soda.¹ Similar porcellanized slates are seen in many of the greenstone promontories north of this and at Lundy Beach near Port Quin, north of the Camel, where the rock contains 9·35 per cent of soda and ·39 per cent of potash.

East of Trevoze Head lies Mother Ivey's Bay, where at the east end of the beach a shelf of blue slate near high water mark has yielded *Tentaculites*, small brachiopods, *Centronella*, a form allied to *Retzia longirostris*, *Orthoceras*, and a specimen of *Hyolithes*, all pyritized. This locality has become famous recently by the discovery of a fragment of a large new trilobite, *Homalonotus Barratti*, so named by Dr. H. Woodward, F.R.S., in honour of the discoverer.²

We next reach Cataclews Point, famous for its variety of igneous rocks. It gives its name to a stone that has been quarried for centuries for architectural purposes. The tomb of Prior Vivian in Bodmin church is an example of its durability and value. It is a fine grained greenstone, for the most part an altered picrite. Harlyn Bay is more famous for its prehistoric cemetery than for older remains, and New Train Bay introduces us to Trevone, which has proved a storehouse of interest. The fossils are mostly pyritized, and unfortunately the scour of the sand is not sufficiently severe to weather fresh fossils rapidly. Trevone cliffs and foreshore have yielded *Orthoceras*, *Bactrites*, *Goniatites*, *Euomphalus*, *Tentaculites*, trilobites, corals, brachiopods, *Styliola*, and two fossils characteristic of Upper Devonian rocks, viz. *Bactrites budesheimensis*, F. Roemer, and *Cardiola retrostriata*, Von Buch.³

Trevone Bay is bounded on the north by Roundhole Point, and the northern side of this promontory is composed of the noted 'Marble Cliffs,

¹ Described *Geol. Mag.* decade iv. vol. ii. No. 367, 1895.

² Vide *Geol. Mag.* No. 463, January, 1903, pp. 28-31.

³ Vide *Trans. R. Geol. Soc. Corn.* xii. 535-45.

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which are formed of alternate bands of limestone and shale extending from the foreshore to the top of the cliff for a distance of 350 yards. The limestone bands vary from 2 inches to 2 feet thick, weather a yellowish grey, and form a marked contrast with the dark shale ; there are from sixty to seventy distinct beds of each dipping at a low angle under the greenstone. The blue and grey slates on both the north and south banks of the Camel yield fossils of small interest, and amid these slates are other beds 2 miles in extent of purple and green variegated slates with a general southerly dip which have hitherto yielded no fossil of any kind. North of these occasional fossiliferous beds of slate occur ; the most interesting of which is in Epphaves Cove in Port Quin Bay. This has recently yielded a small starfish, *Ophiurina* (?), besides some tiny pyritized thorn-like organisms at present undetermined.

Mr. S. R. Pattison,¹ writing on the geology of the Tintagel district in 1847, says that fossils between Boscastle and Port Isaac were found in and near the good slate and in an earthy bed among the slates. He records *Fenestella* at Bossiney, *Spirifera gigantea* and *S. disjuncta* and crinoids at Tintagel, Delabole, Lesnewth and Trevivian, and *Terebratula* and *Orthis* at Tintagel. He adds : ‘Fragments of *Spirifera* may be seen in the roofing and flooring slates of all the quarries from Grower to Delabole.’ Good specimens of much flattened *Spirifers* are still constantly found in the Delabole quarries.

Sir Henry De la Beche in his Report gives a sketch of the junction of the Devonian and Carboniferous rocks as seen from a boat outside the harbour of Boscastle. He writes thus : ‘Proceeding now to the southern boundary line of this (Carboniferous) system . . . we find that the upper series rests upon the lower near Boscastle, in a bay between the Meachard Rock and Short Island. Here though the one rests conformably upon the other, as represented (plate 4, fig. 1), there is no passage of the one system into the other. On the contrary, there is a marked line between the carbonaceous slates and arenaceous rocks above and the clay slates passing into roofing-slate beneath.’

About a mile north of this junction line, the crest of Fire Beacon Point, a very conspicuous landmark 469 feet above sea level, is composed of a cherty rock showing casts of radiolaria. The foldings of the intervening beds of grit and shale are numerous, but cannot be on a large scale, as the chert appears nowhere else on the north coast. As we follow the coast northwards the foldings and contortions increase in size and complexity till we reach the extraordinary sections for which the ‘Northern Door’ and ‘Millook’ are so notable. Further north General McMahon in writing of Bude says that in some places the contortions and convolutions are too complicated for verbal description . . . Beds are not only doubled up and folded on themselves, but they are crushed, ruptured and severed from each other in a way that has, in places, reduced them to the condition of a Chinese puzzle. The conclusion he arrived at after a microscopical examination of the rocks, was that the

¹ *Trans. R. Geol. Soc. Corn.* vii. 3-12.

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Culm series at Bude appears to have been deposited in tranquil water undisturbed by strong currents. As the radiolarian chert of Mullion Island traced eastward into Goran gave a datum line for the Ordovician rocks of south Cornwall, so this northern chert acts as a datum for the lower Culm Measures of Cornwall, Devon and Somerset.¹ From Fire Beacon Point it is traced in surface stones and in a series of quarries and exposures from this point to the Tamar. A quarry $1\frac{1}{2}$ miles north of Launceston is marked on the 6-inch ordnance map 'Barracadoes Quarry (killas).' The beds in it however are not at all of the nature of killas, but consist mostly of light-tinted, banded, very hard siliceous rock with interbedded soft grey shaly beds, which are crowded with radiolaria and sponge spicules. Carzantic Quarry, 2 miles E.S.E. of Launceston, exposes a thickness of 50 feet of beds of compact chert without admixture of soft shaly beds, and throughout the series radiolaria can be distinguished, being in some beds thickly crowded together. If the formation of these cherts is mainly due to the silica separated from the sea-water by radiolaria, possibly also in part by sponges and diatoms, we must draw a heavy cheque on the bank of geological time to allow for the enormous interval necessary for the accumulation of such a thickness of rock by the gradual deposition of the skeletons of these microscopic organisms.

Dr. Holl in his paper 'On the Older Rocks of South Devon and East Cornwall,'² gives the result of his careful survey of the Culm Measures of east Cornwall, and makes his line of junction between the Devonian and Carboniferous rocks cross the Tamar at Horsebridge near the horizon of Tavistock. The radiolarian character of the cherts in this district confirms Dr. Holl's view that they belong to the Culm series. Quarries near Landlake Cross, at Trenute, Trekenner Head, with outlying patches at Painter's Cross, 4 miles north-west of Saltash, and a quarry 500 yards east of Pillaton church are all composed of radiolarian cherts, the southern ones being brought up by Lower Culm folds.

Mr. S. R. Pattison,³ in his paper on the Carboniferous system in Cornwall, says the plant remains in the broken cliffs close to the breakwater at Bude are found in greater numbers and better preservation than elsewhere, although still in an extremely defective state as specimens. He records '*Posidoniox* and *Goniatites* with plants at Truscott and St. Stephens, and *Trilobites*, *Orthis* and *Turbinolopsis* at Underwood and St. Stephens.'

The rocks which enter into the composition of the Lizard peninsula, as defined by the seaboard extending from Porthalla to Polurrian Cove, are of a totally different character from the rock bands

¹ 'On a well-marked Horizon of Radiolarian Rocks in the Lower Culm Measures of Devon Cornwall and Somerset,' by G. J. Hinde, F.R.S., and Howard Fox, Q.J.G.S. li. (1895), 609-67.

² Q.J.G.S. xxiv. (1868), 401-14.

³ Trans. R. Geol. Soc. Corn. vi. 267-75.

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which occupy the rest of Cornwall. The transition between the respective rock types is sudden, and the line of demarcation appears also to be a line of dislocation. The precise relations therefore of the killas and the Lizard rocks have not been determined.

The dominant rock in the Lizard peninsula is undoubtedly serpentine, which covers an area of about 20 square miles, while associated with it are considerable masses of gabbro and hornblende schist. Granite and greenstone (epidiorite) are of subordinate occurrence; while the extreme south of the peninsula is occupied by schists and gneisses.

The serpentine extends from Lizard Town on the south to Polwin in the north. It is seen along the east coast from Coverack Cove to the bay below the village of Landewednack; and on the west coast between Pentreath Beach and George's Cove, and further north at Mullion Cove. Smaller masses occur in the vicinity of Porthalla.

The variety of the Lizard serpentine constitutes one of its most striking characteristics. This is largely due to the fact that the rock is a product of alteration of pre-existing rock masses; not only did the latter differ in mineral constitution, but the extent of their decomposition, which has given rise to the serpentine, has not been uniform. While in some instances the metamorphism has been complete, in others the original rock is still represented by portions that have been undestroyed.

The serpentine has been mainly derived, as shown by Professor Bonney, from olivine bearing rocks, the decomposition of that mineral especially favouring its production. Moreover, other magnesian minerals pass into serpentine in a similar manner. According to Professor Bonney, the handsome mottled varieties, with conspicuous crystals of bronzite occur chiefly in the southern and south-eastern regions, along the coast from the Balk to Coverack Cove, and as far inland as the neighbourhood of Ruan Major: the fine black variety with glittering bronzite crystals being found on the coast south of Caerleon Cove; as also on the west coast to the north of Kynance Cove (near the Horse). South of that and at the Rill, as well as to the north at Gue Graze, George Cove and near Mullion Cove, compact dull-coloured varieties are commoner, and these are seen by the Helston Road on the northern part of the mass. In close association with these is the dull-coloured variety, containing small glittering crystals, which appear to be mainly a pyroxenic or hornblendic mineral (grammatite), found especially about Lower Pradanack and in Mullion Cove.¹

A small patch of serpentine also occurs (beyond the Lizard region) in Gerrans Bay near the Nare Head. This rock varies from a massive to a sheared serpentine, and like the serpentine of the Lizard occurs in association with gabbro. The relations however of the serpentine and gabbro to the 'killas' are obscure, as neither of the former reaches the coast.

Next in importance to the serpentine are the large intrusive masses of gabbro; moreover smaller veins of gabbro pierce the ser-

¹ *Quart. Journ. Geol. Soc.* xxxix. 23.

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pentine. A large mass of gabbro forms the cliffs between Coverack and Manacle Point, and extends inland for about 4 miles as an ovate mass occupying an area of 6 or 7 square miles, including the districts of St. Keverne and Crousa Downs. A smaller mass $\frac{1}{4}$ mile in width extends inland from the headland of Karakclews to Gwinter. Another considerable exposure occurs on the shore near Landewednack.

According to Mr. Teall the principal constituents of the Lizard gabbro are plagioclase, augite or diallage, hornblende, olivine and saussurite, while original iron ores are rare or altogether absent.

The dioritic rocks that occur in this region appear as veins in the gabbro, and as part of a banded series consisting mainly of diorite and a fine grained granite. In places the two latter types vein each other, while they sometimes occur together as parallel bands. Mr. Teall describes the constituents of the dioritic rocks as felspar, biotite, green hornblende, sphene, iron ores and apatite.

The granite of the Lizard peninsula occurs as veins in the serpentine, gabbro and dioritic rocks, and is of different character from the Cornish granite already described from beyond that region. That of the Lizard has been deformed into schist. It veins the serpentine at Kynance, a dioritic rock at Pen Voose, and occurs in a gabbro north of the last-named locality, and also veins a diorite at Kennack Cove.

Hornblende schist forms a wide band at the northern edge of the Lizard complex and appears to extend practically right across the peninsula from sea to sea. This rock differs from the hornblendic rocks described from beyond the Lizard area in the frequent development of a highly banded character, which is so perfect that viewed from a short distance the white and green striping, representing the differentiation of the felspathic and hornblendic minerals, strikes the eye as a parallel arrangement of almost mathematical precision.

Between Porthoustock and Landewednack greenstone dykes occur in the gabbro and serpentine, ranging from epidiorite to hornblende schist, while in some a certain amount of pyroxene still remains. But in the neighbourhood of Coverack there are found dykes of olivine dolerite which have retained their original character.

In the southern portion of the peninsula there is a zone of fine micaceous and actinolitic schists which in the outlying islands have reached a still further stage of metamorphism, and as pointed out by Mr. Howard Fox consist of typical gneiss. As remarked by Mr. Teall this zone of intense mechanical metamorphism includes lenticles and bosses of greenstone associated with actinolitic and hornblende schists, the latter having originated in part at least from the metamorphism of the former.

In recent years keen controversies have arisen among geologists regarding the origin of the foliated igneous rocks and the relative ages of the serpentine and hornblende schists. On one hand it is contended that the foliation of the gabbro and the passage of dykes of porphyritic epidiorite into hornblende schist have been produced by dynamic metamor-

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phism after the consolidation of the rocks from the original magma. On the other hand the foliation sometimes present in the gabbro is ascribed to movements when the rock was in a condition of imperfect fluidity, and not to pressure after the consolidation of the rock.

The cleavage of opinion regarding the relative ages of the serpentine and hornblende schist is equally well marked. On the one hand it is maintained that the hornblendic and granulitic groups were in their present condition when the rock which is now a serpentine was injected, the serpentine being the result of the alteration of some variety of peridotite. It is further contended that the granulitic group includes two types of rock, one acid, the other basic, the former being intrusive into the latter, and that as a result of this increase of temperature, or from some other cause, the temperature of the whole mass was so elevated as to permit of movements that gave rise to the finely stratified appearance of the two varieties.

On the other hand the opinion is held that the serpentine, hornblende schists, etc., form a banded complex of crystalline foliated rocks, the relative ages of which cannot be satisfactorily determined; but if there be any difference in age that the serpentine is probably the earlier of the two.

ADDENDUM

Since this article was written we have obtained important evidence bearing on the relations of the Devonian and Silurian formations of Cornwall. In the previous pages we referred to the fact that the conglomerates of Nare Point, Grampound, and Probus probably represented an unconformity dividing those formations. That inference has now been finally established. The Nare Point conglomerate is seen at Gillan Harbour in association with the Portscatho series, and the boulders of the former have been mainly derived from the latter series. The fact, moreover, that the fragments were veined with quartz prior to such incorporation sufficiently indicates the magnitude of the break represented by this unconformity. The conglomerate is associated with sandstone and clay slate that are often slightly calcareous. The conglomeratic deposit is by no means continuous, so that the finer beds often represent the base of the formation, where they may be seen at Manaccan wrapping round the bosses of Silurian quartzite. The identity of this younger sequence of Manaccan with corresponding beds at Probus and Grampound has been further established, and as the latter in their northward extension pass into fossiliferous horizons of Devonian Age, this conglomeratic series represents the base of that formation. In the Meneage peninsula these rocks extend in a westerly belt from the coast between Gillan Creek and Nare Head. In that westerly extension they abut for some distance against the Lizard metamorphic rocks, the margin of which is otherwise in contact with the Silurian formation. The junction therefore between the Lizard rocks and the killas must represent a profound discordance.

The Portscatho series, therefore, and the associated Falmouth, Mylor and Veryan beds belong to the Silurian system; and as the Veryan beds appear to pass into the Caradoc quartzite, they may probably be relegated to the lower division of that system. The upper Silurian division is nevertheless represented, as determinate fossils have been recorded at Gorran Haven, Porthluney, and other localities.

The Devonian of Meneage may be regarded as a large outlier amongst the Silurian horizons. The main boundary between the two formations extends in an easterly direction from Porth Towan to Probus and Creed, it then passes to the north of Tregoney, from which it sweeps round to the south and thence follows an irregular course to the coast at St. Michael Caerhayes.

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Recent researches of Mr. Howard Fox have extended our palaeontological knowledge of the Devonian tract described by that geologist and embodied in this article, an account of which will be found in the *Transactions of the Royal Geological Society of Cornwall* (vol. xiii, parts 1 and 2).

The geological map requires a word of explanation. The author would have preferred to leave the Culm measures undifferentiated, but having been divided in the Devonshire map, the editor felt it incumbent to adopt the same system in Cornwall for the sake of uniformity. This differentiation however was not undertaken by the author, who desires to point out that the junction drawn between the Culm measures and the Devonian must not be taken to represent an unconformity as the colouration would suggest. The two small patches of serpentine east of Porthallow have been incorrectly coloured as Silurian. The following errors, moreover, appear in the right-hand column of the index of the map :—‘Devonian Red Sandstone’ should read ‘Devonian killas’; ‘Upper Silurian’ should read ‘Lower Silurian.’

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VERTEBRATE remains are very scarce in Cornwall, this being no doubt due to the nature of the rocks of the county. Among mammals remains of the red deer (*Cervus elaphus*) are recorded from the superficial deposits of St. Columb, and those of the reindeer (*Rangifer tarandus*), the wild horse (*Equus caballus fossilis*), the mammoth (*Elephas primigenius*), and the great cave-lion (*Felis leo spelaea*), from Otterham.

Of far greater interest than any of the foregoing are, however, certain bones of a whalebone whale from a superficial formation at Petuan in the parish of St. Austell, which are preserved in the museum at Penzance and have been described by the late Sir William Flower in the *Annals and Magazine of Natural History* for 1872 (ser. 4, vol. ix, p. 440), and in the *Transactions of the Royal Geological Society of Cornwall* for 1875 (vol. ix, p. 117) under the name of *Eschrichtius robustus*. They were dug up some time prior to the year 1829, at a distance of about half a mile from the shore at a depth of some twenty feet below the surface in a bed of river-silt and gravel. By Sir William Flower they were identified with a species previously known by a subfossil skeleton from the Swedish Island of Gräsö in the Baltic, which had been named *Balaenoptera robusta* by Professor Lilljeborg, but which Dr. J. E. Gray made the type of the genus *Eschrichtius*. That skeleton was found in a deposit of partly clay and partly sand at a depth of between two and four feet below the surface, and from ten to fifteen feet above the present level, and at a distance of over 800 ft. from the shore.

That these two skeletons indicate a whale generically distinct from any now inhabiting the Atlantic and adjacent seas is quite certain; and the only question is whether the Pacific grey whale, described subsequently as *Rhachianectes glaucus*, is not the same. It is scarcely likely that a species which lived at such a comparatively recent epoch as the one indicated by the deposits in which the two skeletons were found should have become totally extinct.

Between the foregoing scanty list of mammals from formations of Pleistocene or later age, no vertebrate (or perhaps we should rather say chordate) remains appear to be known from the county till we reach the Lower Devonian, from which formation at Polperro, Fowey, and Lani-vet Bay have been obtained numerous specimens of the bony shields of armoured fish-like creatures constituting the Palaeozoic family *Pteraspidae*. Originally these interesting fossils were described by the late Sir F. M'Coy¹ as sponges, and named *Steganodictyum cornubicum*; but their fish-like nature

¹ *Ann. Mag. Nat. Hist.* (2) viii, 481 (1851).

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was subsequently recognized by Mr. C. W. Peach,¹ who collected many specimens ; and still later they were assigned by Mr. J. W. Salter² to the typical genus *Pteraspis*, although this determination was not accepted by Professor E. Ray Lankester,³ who renamed them *Scaphaspis cornubica*. Even this determination was not, however, final, for in 1898 Dr. A. Smith Woodward, in describing⁴ some of the finely ribbed plates of these fish-like creatures from Lanivet Bay, wrote as follows :—

‘They have sometimes received the name of *Scaphaspis*, which now proves to be applicable to the ventral shield of any member of the family ; more recently they have been provisionally assigned to the genus *Pteraspis*. All the known specimens are, however, very fragmentary ; and hitherto there have been no means of determining their generic relationships. A specimen recently submitted to me by Mr J. H. Collins, and two other specimens in the British Museum, now seem to furnish the necessary facts for this determination, and indicate that, so far as the dorsal armour is concerned, the Cornish species truly belongs to the type genus *Pteraspis*.

‘It is thus evident that the Cornish Devonian pteraspidian has a complex⁵ dorsal shield, that the orbit is completely surrounded by a special orbital plate, and that a short dorsal spine is fixed in a cleft at the hinder border of the median disc. These, in combination, are the special characteristics of *Pteraspis* as now defined, and prove, as already mentioned, that the Cornish species is correctly described under the name of *P. cornubica*. It seems to be the largest species of the genus hitherto discovered.

‘It may be added that in Western Europe *Pteraspis* is characteristic only of the Lower Devonian or Lower Old Red Sandstone, not descending below the base of this formation, where it is preceded by [forms with] a simple shield, *Cyathaspis*. In Galicia, however, typical species occur in strata which are claimed to be of Downtonian or even Ludlow age.’

Fragmentary remains probably of *Cephalaspis* have also been found with these Pteraspidians⁶ ; and some associated plates may belong to the Arthrodiran *Pblyctaenaspis*.⁷

¹ *Rep. Brit. Assoc. for 1843, Trans. Sect.* p. 56.

² *Geol. Mag.* v, 247 (1868).

³ *Ibid.* 248.

⁴ *Trans. Roy. Geol. Soc. Cornwall*, xii, pt. 4 (1899).

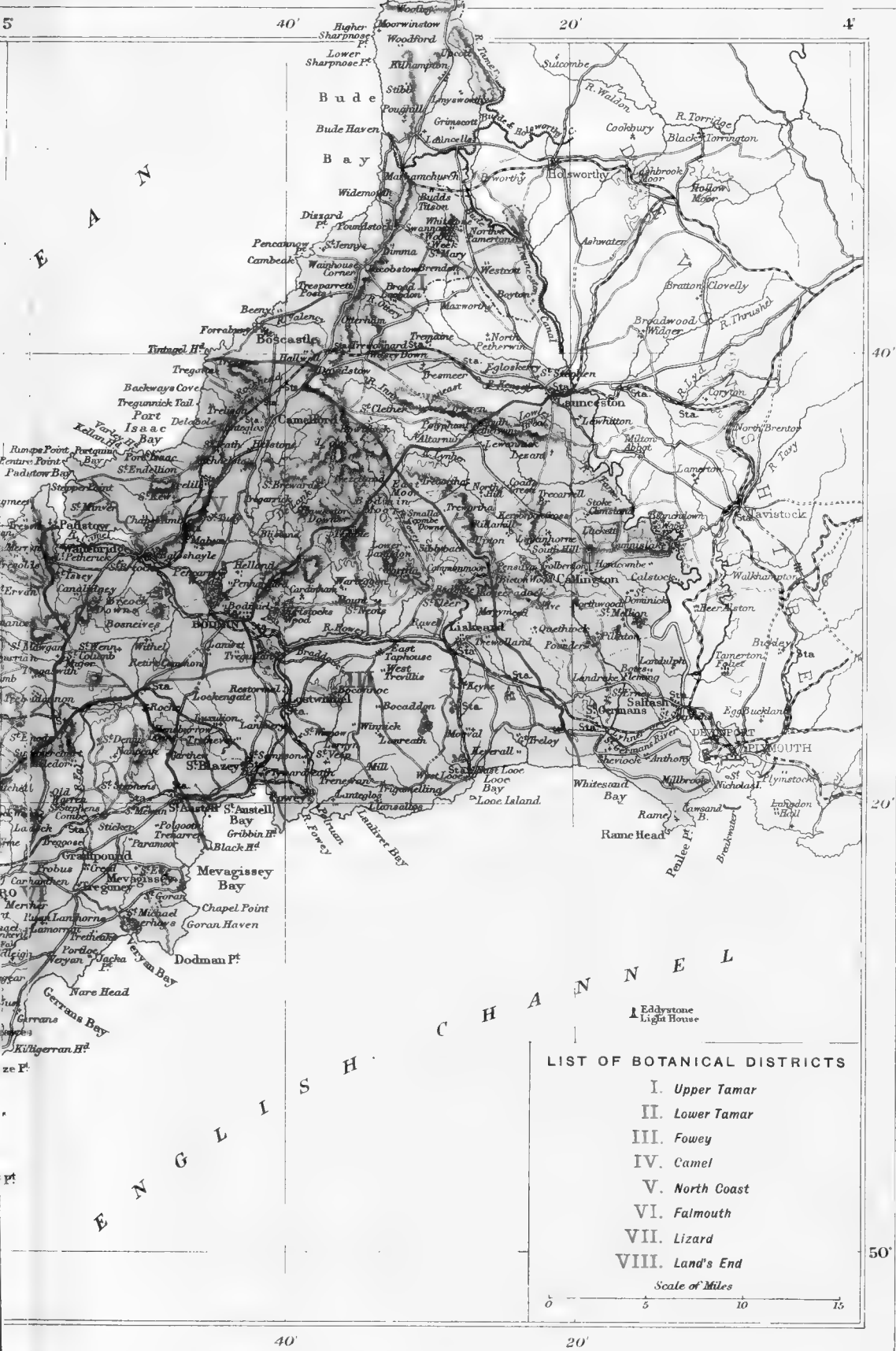
⁵ Misprinted ‘complete’ in the original.

⁶ A. Smith Woodward, *Trans. Roy. Geol. Soc. Cornwall*, xii, pt. vi (1901).

⁷ A. Smith Woodward, *Geol. Mag.* [4] vii, p. 148 (1900).



AL DISTRICTS.



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A BRIEF glance at a map of Cornwall would prepare the average field botanist for a rich harvest. Favoured geographically, inasmuch as they come within range of the genial operations of the Gulf Stream ; including a coast line which may be taken approximately as 250 miles ; furnished with a chain of bold hills forming a sort of backbone to the county ; and including among other advantages densely wooded and well watered valleys opening to the sea on both the north and the south coast, a good deal of land peculiarly favourable to paludal and ericetal plants, and long stretches of beach and blown sand where all kinds of littoral subjects lurk, the 887,740 acres of which from a botanical point of view Cornwall is comprised hold probably a larger number of species than any other British county of the same size. If meteorological values be added to the map another key will have been furnished to the richness of the flora. To say nothing of the high mean bright sunshine, and of the mean range of temperature for the coldest months whereby the winters become 'languid springs,' the rainfall is so high, and taking the county as a whole so erratic, as greatly to modify the botanical features. Compared with many other English counties Cornwall's mean rainfall of 48 inches is rather great, but its peculiarity does not end there. Although only 80 miles in its greatest length there is a marked contrast between the rainfall of the two extremes of the county. East Cornwall has an average rainfall of 55 inches and west Cornwall 43 inches. The higher figure corresponds with the greatest breadth of the county, which may be taken as 45 miles, and the lower with the narrowest section, which in one place falls below 6 miles. As will subsequently appear, the two sections so marked off have their own characteristic floras. East Cornwall may be regarded as the haunt of *Rubi*, and west Cornwall as the district of *Leguminosæ* and *Characeæ*.

The only islands off the Cornish coast possessing special botanical interest are the Scillies, lying 27 miles west of the Land's End. Between the flora of these islands and the mainland there is much in common, though the absence of hills, woods and rivers tells a very important tale. Nearly two-thirds of the plants growing on the mainland have been found on the Scillies. Among the absentees however are several very common species. Plants which have been found there and not on Cornish soil proper are *Polygala calcarea* (one specimen), *Trifolium repens* var. *Townsendii*, *Ornithopus ebracteatus*, *Filago spatbulata*, *Eleocharis uniglumis*,

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Carex ligERICA, *Festuca uniglumis*, *Sesleria cœrulea* and *Ophioglossum vulgatum* var. *polyphyllum*. Of these the second and third have yet to be sought out in other parts of Great Britain, and the sixth has only been found in one other county, viz. Norfolk.

The Cornish heights are singularly unprolific. A few Batrachian *Ranunculi* and *Utricularias* in shallow pools, half a dozen or so local *Carices* on the windswept heaths, and the two species of filmy ferns are all they offer of interest to the collector. Sixteen of these hills run to over 1,000 feet, the highest, Brown Willy, 1,375 feet above sea-level. In the east the Cornish heights possess much of the wild grandeur associated with the Tors of Devon, but towards the west the chain becomes much interrupted and the hills lose elevation until at the Scillies the highest peak is only 220 feet. This goes far to explain the difference in the rainfall above mentioned. As the sources of the thirty-three principal streams the hills play no unimportant part in plant geography, for it is along the moist shady banks and at the estuaries of the streams that the most varied flora exists. The narrowness of the county precludes the possibility of great rivers. Those at all deserving that name are the Tamar, draining 40 miles of the county, Fowey 30 miles, Camel 29 miles, Lynher 27 miles, Fal $19\frac{1}{2}$ miles, Inny 19 miles, Attery 14 miles, and the Seaton and Looe 12 miles each. With the exception of the Camel the principal streams run from the 'backbone' of the county to the south coast. Here again the result is two markedly distinct floras.

The only sheets of water west of the Tamar approaching lakes are the Loe Pool near Helston, Dozmare Pool in the parish of St. Neot, Swanpool near Falmouth, and Hayle Kimbra on the Goonhilly Downs. Loe Pool is the only place in Cornwall where *Corrigiola littoralis* has been found, and the only British station for *Nitella hyalina*. Swanpool gives *Ghara aspera*, *G. bispida* and *G. canescens*, while Hayle Kimbra gives *G. aspera* and its interesting variety *desmacantha*. Dozmare Pool has no attraction for the botanist.

While the character of Cornwall has been much changed by cultivation on the one hand and by mining operations on the other, not a single species of plant has suffered extinction by these causes. Those portions of the county which were marshes and bogs 100 years ago are for the most part in the same condition to-day, and the rarities which Ray and Turner and Jones found are still there. Along the coast also, where a continual fretting away of the cliffs is going on, and where the encroachment of the sands is becoming more and more manifest, the old species hold their ground albeit in some cases showing a diminution in the number of plants. Among the species which have become extinct through no other apparent cause than inability to retain a hold on the soil are *Ranunculus circinatus*, *Mathiola sinuata*, *Hypericum linarifolium*, *Althæa officinalis*, *Lathyrus maritimus*, *Potentilla argentea*, *Pyrus domestica*, *Drosera anglica*, *Lytbrum Hyssopifolia*, *Diotis candidissima*, *Chenopodium hybridum*, *Urtica pilulifera*, and *Trichomanes radicans*. *Corrigiola littoralis*, once so abundant on the Loe Pool, has not been found there now for four

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years. The water level of the Pool has been so raised as completely to cover the ground where this humble plant grew, and it is to be feared that it must now be included amongst the extinct species of the county. The occurrence of *Trichomanes radicans* near Tintagel has been much questioned in botanical circles, but the letter from Mr. Everard F. im Thurn in *Nature*, 27 April 1871, leaves no reasonable room for doubt that it was really gathered in that locality.

A few plants have been included in Cornish lists through misconception. Until stronger evidence than we already possess is forthcoming the following must be accepted with considerable reserve: *Thalictrum Kochii*, *Helianthemum marifolium*, *Geranium sylvaticum*, *Rhamnus catharticus*, *Trifolium stellatum*, *Saxifraga stellaris*, *Cicuta virosa*, *Oenanthe Pbellandrium*, *Galium Cruciata*, *Gnaphalium luteo-album*, *Senecio squalidus*, *Arnoseris pusilla*, *Hieracium corymbosum*, *Campanula latifolia*, *Primula farinosa*, *Veronica spicata*, *Melampyrum sylvaticum*, *Lathræa Squamaria*, *Suæda fruticosa*, *Damasonium stellatum*, *Rynchospora fusca*, *Asplenium fontanum*, *A. septentrionale*, *Ophioglossum lusitanicum*.

Recent investigations have not only added many native species to the flora of the county but have shown that several foreign plants have secured a permanent footing, and will have to be accounted for in future handbooks of the British flora. *Erysimum repandum* has long been known near Launceston in goodly numbers and occurs more sparingly at Falmouth and Penzance. *Lepidium virginicum* springs up annually at Par and Penzance, and for more than a quarter of a century *Rapistrum rugosum* has claimed two or three spots at Falmouth. *Impatiens Roylei* grows by the thousand in the valley between Liskeard and Looe, and more sparingly though none the less luxuriantly near Tintagel. *Aster Novi-Belgii* is a striking plant at Looe and Par, where it has long been growing. *Matricaria discoidea* is perhaps the most astonishing case of an alien becoming a denizen. First appearing at Falmouth less than a decade ago, it has now become a pestiferous weed all over the district, being found in fields and by the roadside in at least half a score of parishes. *Mimulus Langsdorffii*, *M. moschatus*, *Omphalodes verna* and *Phalaris aquatica* are other foreign subjects which have shown adaptability to Cornish soil.

To say Cornwall possesses more specialities than any other English county is to repeat what most botanists already know. The last county geographically, it is the first botanically. Here *Brassica Cheiranthus*, a plant still restricted by the *London Catalogue* to the Channel Isles, has been flourishing for half a century and more. Here only in Great Britain grow *Lavatera sylvestris*, *Cytisus scoparius* var. *prostratus*, *Trifolium Molinerii*, *T. Bocconi*, *Ornithopus ebracteatus*, *Erica vagans*, *Echium plantagineum*, *Pinguicula grandiflora*, *Herniaria ciliata*, *Juncus pygmæus*, *J. capitatus*, *Bromus rigidus*, *Chara fragifera* and *Nitella byalina*. With Devon it has shared exclusive possession of *Hypericum undulatum*, *H. linarifolium*, *Pyrus cordata*, *Physospermum commutatum*, *Lobelia urens*, *Scrophularia Scorodonia*, *Euphorbia hiberna*, *Iris tuberosa* and *Romulea Columnæ*.

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Plants occurring in Cornwall with a lower Watsonian comital number than ten are : *Thalictrum majus*, *Matthiola incana*, *Polycarpon tetraphyllum*, *Genista pilosa*, *Medicago falcata*, *Lotus angustissimus*, *L. hispidus*, *Rubus nemoralis*, *R. leucandrus*, *R. ramosus*, *R. Boræanus*, *R. Borreri*, *R. oigoclados*, *R. botryeros* (*Lejeunei*), *R. thyrsiger*, *R. plinthostylus*, *Pyrus rotundifolia*, *Eryngium campestre*, *Hypochaeris maculata*, *Erica ciliaris*, *Microcala filiformis*, *Gentiana baltica*, *Linaria supina*, *Sibthorpia europæa*, *Orobanche amethystea*, *O. Picridis*, *Mentha pubescens*, *Melittis Melissophyllum*, *Illecebrum verticillatum*, *Herniaria glabra*, *Polygonum maritimum*, *Hippophae rhamnoides*, *Asparagus officinalis*, *Scilla autumnalis*, *Juncus tenuis*, *Arum italicum*, *Cyperus longus*, *Scirpus carinatus*, *S. triqueter*, *Fibichia umbellata*, *Briza minor*, *Adiantum Capillus-Veneris*, *Chara canescens*, *Nitella gracilis*.

Until Devon has been more thoroughly worked, a comparison of the floras of the two westernmost counties can only be approximately correct. Although many good lists have been compiled since the publication of the *Botanist's Guide*, nearly one hundred years ago, large tracts still need systematic attention. Investigations in Devon show that its more mountainous character and its greater range of sylvan and moorland features notwithstanding, its flora is not separated from that of Cornwall by any sharp line of demarcation. Neither of the counties is rich in those remnants of a northern flora to which H. C. Watson gave the name 'Highland' and Professor Edward Forbes 'Alpine,' while both have their share of Watson's 'Atlantic' and Forbes' 'Asturian' and 'Armorican' types. The total number of plants reported for Cornwall and for which records for Devon are still wanting is 129, but for a satisfactory comparison of the two floras this number must be greatly reduced. Taking no count of species printed in italics in the *London Catalogue*, and excluding those which though natives of other parts of Great Britain have found their way into Cornish lists on the strength of a stray record or as recognized aliens or strays from cultivation, Cornwall may claim sixty plants not yet known to occur in the neighbouring county. Some of these have been already mentioned when dealing with plants restricted to Cornwall. Of the remainder the more important are : *Thalictrum flexuosum*, *T. majus*, *Silene conica*, *Arenaria verna* var. *Gerardi*, *Genista pilosa*, *Galium sylvestre*, *Aster salignus*, *Filago apiculata*, *F. spathulata*, *Hieracium rigidum*, *H. crocatum*, *Erica ciliaris*, *Gentiana baltica*, *Mentha pubescens*, *Herniaria ciliata*, *Atriplex littoralis*, *Euphorbia platyphyllos*, *Allium Schaenoprasum*, *A. sibiricum*, *Cyperus longus*, *Eleocharis uniglumis*, *Cladium Jamaicense*, *Chara polyacantha*, *C. baltica* var. *affinis*. Among the 69 items by which Devon has Cornwall at a disadvantage are : *Myosurus minimus*, *Fumaria Vaillantii*, *Nasturtium amphibium*, *Helianthemum Chamæcistus*, *H. polifolium*, *Dianthus deltoides*, *Hypericum hirsutum*, *Hippocrepis comosa*, *Potentilla verna*, *Bupleurum tenuissimum*, *B. aristatum*, *Trinia glaberrima*, *Aster Linosyris*, *Artemisia maritima*, *Lithospermum purpureo-cæruleum*, *Teucrium Scordium*, *Pinguicula vulgaris*, *Utricularia intermedia*, *Hydrocharis Morsus-ranæ*, *Malaxis paludosa*, *Orchis ustulata*, *Listera cordata*, *Epipactis media*, *Ophrys muscifera*, *Sagittaria sagitti-*

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folia, *Acorus Calamus*, *Scirpus Holoschænus*, *Carex teretiuscula*, *C. paradoxa*, *C. rigida*, *C. digitata*, *C. montana*, *C. strigosa*, *C. filiformis*, *Alopecurus fulvus*, *Spartina stricta*, *Calamagrostis lanceolata*, *Equisetum hyemale*, *E. variegatum*, *Selaginella selaginoides*, *Lychnothamnus stelliger*.

The comparatively late date at which anything like serious attention was given to Cornwall by botanists, added to the insularity of its flora, would naturally provoke an inquiry as to how many and what British plants were first recorded from the county. Naturally the list is small. Until Ray's time Cornwall was not even dreamed of as a charmed county for wild flowers, and few references to Cornish plants will be found in botanical works published before the *Catalogus Plantarum Angliæ* (1670). Flowering plants first recorded for Great Britain from Cornwall are: *Fumaria confusa*, *Cardamine amara*, *Coronopus didymus*, *Lepidium rudemale*, *Reseda alba*, *Viola lactea*, *Erodium maritimum*, *Oxalis stricta*, *Trifolium Molinerii*, *T. Bocconi*, *T. strictum*, *Lotus hispidus*, *Ornithopus ebracteatus*, *Potentilla Fragariastrum*, *Agrimonia odorata*, *Physospermum commutatum*, *Fœniculum vulgare*, *Valerianella dentata*, *Erica ciliaris*, *E. vagans*, *Microcala filiformis*, *Erythraea pulchella*, *Gentiana baltica*, *Linaria repens*, *Scrophularia Scorodonia*, *Sibthorpia europæa*, *Bartsia viscosa*, *Orobanche amethystea*, *Pinguicula lusitanica*, *Littorella juncea*, *Illecebrum verticillatum*, *Herniaria ciliata*, *Polygonum Raii*, *Euphorbia Peplis*, *Iris tuberosa*, *Allium sibiricum*, *A. triquetrum*, *Juncus pygmaeus*, *J. capitatus*, *Fibichia umbellata*, *Briza minor*. The abbreviated character of this list will be appreciated when it is understood that although the works of Turner, Lobel, Bauhin, and Gerarde, ranging from 1538 to 1641, contain several hundred first notices, Cornwall was an unknown land to those authors.

Gerarde's *Herbal* (1633) is the starting point of Cornish botany, but it contains only one reference; even that one, *Plantago maritima*, belongs to the Scilly Isles. With Merrett's *Pinax Rerum Naturalium*, Parkinson's *Theatrum Botanicum*, Ray's several works, Hudson's *Flora Anglica*, and Withering's *Arrangement*, disappeared the old order. The publication of the *Botanist's Guide* (1805) was the beginning of that vast accumulation of facts, scattered it is true, which is now at the disposal of the student of the flora of Cornwall. Jones' *Botanical Tour* (1820) and Watson's *New Botanist's Guide* (1835) brought the county more into line with its neighbours. Then in rapid succession followed a number of workers—Rev. W. T. Bree, C. C. Babington, W. Borrer, Rev. W. S. Hore, G. S. Gibson, Rev. C. A. Johns, W. Curnow, Dr. Ralfs, F. V. Pascoe, T. R. A. Briggs, I. W. Keys, H. C. Bastian, T. Q. Couch, Rev. W. Moyle Rogers, H. and J. Groves, J. Cunnack, Dr. Hind, J. G. Baker, Miss Warren and others, whose contributions to the *Botanical Gazette*, the *Phytologist*, the *Journal of Botany*, and to the Transactions of local scientific societies are of greatest value. The most serious work on the flora was done by Mr. Keys, Mr. Briggs, and Dr. Ralfs. In the *Transactions* of the Plymouth Institution and Cornwall Natural History Society, 1865–71, Mr. Keys published in

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five parts a 'Flora of Devon and Cornwall.' The effort was a very ambitious one, but while in many respects a valuable piece of work it was marred by grave defects. Intended as a guide to the flora of both counties, it gives only a few localities for each plant, and while showing some acquaintance with the writings of older botanists, it omits mention of many valuable records. Briggs' *Flora of Plymouth* on the other hand is the work of a man who is careful, thorough, methodical, and trustworthy. It deals only with that portion of the county lying within twelve miles of Plymouth, but that area has been most exhaustively treated both as regards field work and reference literature. Dr. Ralfs' industry is shown by the MS. Flora of West Cornwall, running into ten volumes, now in the possession of the Penzance Library Committee. Few more enthusiastic botanists have explored the hills and valleys of Cornwall, and none have left behind a more lasting monument of their labours.

To Mr. F. Townsend must be given credit for the first serious attempt to compile a flora of the Scilly Isles. Before his visit in 1864 the literature bearing on the subject was aggravatingly restricted. Borlase's *Observations on the Ancient and Present State of the Islands of Scilly* (1756) makes mention of just a handful of plants. North's *Week in the Isles of Scilly* (1850) adds many species, particularly in the way of ferns, and a great fillip was given to the study in 1852 by the publication of a paper by Misses L. and M. Millett in the *Report* of the Penzance Natural History and Antiquarian Society. Twelve years later the *Journal of Botany* printed Mr. Townsend's contribution, and for the first time 'Lyonesse' had received justice. Further discoveries have since been announced by Dr. Ralfs, Mr. A. Somerville, and Rev. H. Boyden.

It is but fair to add that in June 1902 the writer of this article printed for private circulation among the ever-increasing band of workers who are assisting him in elucidating the flora of Cornwall *A Tentative List of the Flowering Plants, Ferns, etc.* This volume of about 300 pages summarizes all that has been done in connection with the flora of the county from earliest times down to the commencement of the year 1902.

Grateful acknowledgment is here made of valuable assistance received by the writer from botanists long recognized as specialists in certain branches of the science. To Mr. E. M. Holmes, of the Pharmaceutical Society's Museum, he is indebted for the valuable lists of mosses, marine and freshwater algæ, fungi, lichens, etc. Mr. Holmes has long been an industrious worker at these sections, and his contributions to this article will afford an excellent bird's-eye view of the richness and almost unique character of the Cornish flora. The Rev. W. Moyle Rogers, whose unrivalled knowledge of the genus *Rubi* is too widely known to call for comment here, has prepared a capital summary of what has been done regarding the brambles of the county; and Messrs. H. and J. Groves of *Ghara* fame have very kindly corrected the list of plants with whose distribution they are so intimately acquainted.

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SUMMARY OF FLOWERING PLANTS, FERNS, ETC., FOUND IN CORNWALL

Arranged in orders according to the *London Catalogue*, 9th edition (1895)

| Order | Species in roman | Species in italics | Total | Order | Species in roman | Species in italics | Total |
|-------------------------|------------------------|--------------------------|-------|-------------------------|------------------------|--------------------------|-------|
| 1. Ranunculaceæ . . . | 33 | I | 34 | 48. Gentianeæ . . . | II | — | II |
| 2. Berberideæ . . . | I | — | I | 49. Polemoniaceæ . . . | I | — | I |
| 3. Nymphæaceæ . . . | 2 | — | 2 | 50. Boragineæ . . . | 16 | 4 | 20 |
| 4. Papaveraceæ . . . | 7 | 2 | 9 | 51. Convolvulaceæ . . . | 5 | I | 6 |
| 5. Fumariaceæ . . . | 8 | I | 9 | 52. Solanaceæ . . . | 4 | 2 | 6 |
| 6. Cruciferae . . . | 52 | 13 | 65 | 53. Scrophularinæ . . . | 40 | 5 | 45 |
| 7. Resedaceæ . . . | 2 | I | 3 | 54. Orobanchaceæ . . . | 7 | — | 7 |
| 8. Violarieæ . . . | II | — | II | 55. Lentibularieæ . . . | 5 | — | 5 |
| 9. Polygaleæ . . . | 4 | — | 4 | 56. Verbenaceæ . . . | I | — | I |
| 10. Frankeniaceæ . . . | I | — | I | 57. Labiatae . . . | 46 | 5 | 51 |
| 11. Caryophyllæ . . . | 42 | 2 | 44 | 58. Plantagineæ . . . | 6 | I | 7 |
| 12. Portulacææ . . . | 2 | — | 2 | 59. Illecebraceæ . . . | 5 | — | 5 |
| 13. Tamariscineæ . . . | — | I | I | 60. Amaranthaceæ . . . | — | 2 | 2 |
| 14. Elatineæ . . . | I | — | I | 61. Chenopodiaceæ . . . | 21 | — | 21 |
| 15. Hypericineæ . . . | 10 | 3 | 13 | 62. Polygonaceæ . . . | 25 | I | 26 |
| 16. Malvaceæ . . . | 6 | 3 | 9 | 63. Thymelæaceæ . . . | I | — | I |
| 17. Tiliaceæ . . . | 2 | I | 3 | 64. Elæagnaceæ . . . | I | — | I |
| 18. Lineæ . . . | 3 | I | 4 | 65. Loranthaceæ . . . | I | — | I |
| 19. Geraniaceæ . . . | 14 | 5 | 19 | 66. Santalaceæ . . . | I | — | I |
| 20. Ilicineæ . . . | I | — | I | 67. Euphorbiaceæ . . . | 12 | I | 13 |
| 21. Celastrineæ . . . | I | — | I | 68. Urticaceæ . . . | 6 | I | 7 |
| 22. Rhamneæ . . . | I | — | I | 69. Myricaceæ . . . | I | — | I |
| 23. Sapindaceæ . . . | I | I | 2 | 70. Cupuliferae . . . | 8 | — | 8 |
| 24. Leguminosæ . . . | 64 | 8 | 72 | 71. Salicineæ . . . | 14 | I | 15 |
| 25. Rosaceæ . . . | 89 | 5 | 94 | 72. Ceratophylleæ . . . | I | — | I |
| 26. Saxifrageæ . . . | 5 | I | 6 | 73. Coniferae . . . | 3 | I | 4 |
| 27. Crassulaceæ . . . | 6 | 3 | 9 | 74. Hydrocharideæ . . . | I | — | I |
| 28. Droseraceæ . . . | 3 | — | 3 | 75. Orchideæ . . . | 16 | — | 16 |
| 29. Halorageæ . . . | 9 | — | 9 | 76. Irideæ . . . | 3 | 3 | 6 |
| 30. Lythrarieæ . . . | 3 | — | 3 | 77. Amaryllideæ . . . | 3 | 3 | 6 |
| 31. Onagrarieæ . . . | 10 | 2 | 12 | 78. Dioscoreæ . . . | I | — | I |
| 32. Cucurbitaceæ . . . | I | — | I | 79. Liliaceæ . . . | 15 | 3 | 18 |
| 33. Umbelliferae . . . | 40 | 6 | 46 | 80. Juncaceæ . . . | 21 | — | 21 |
| 34. Araliaceæ . . . | I | — | I | 81. Typhaceæ . . . | 5 | — | 5 |
| 35. Cornaceæ . . . | I | — | I | 82. Aroideæ . . . | 2 | — | 2 |
| 36. Caprifoliaceæ . . . | 6 | I | 7 | 83. Lemnaceæ . . . | 3 | — | 3 |
| 37. Rubiaceæ . . . | 14 | I | 15 | 84. Alismaceæ . . . | 3 | — | 3 |
| 38. Valerianeæ . . . | 9 | — | 9 | 85. Naiadaceæ . . . | 20 | — | 20 |
| 39. Dipsaceæ . . . | 5 | — | 5 | 86. Cyperaceæ . . . | 63 | — | 63 |
| 40. Compositæ . . . | 89 | 12 | 101 | 87. Gramineæ . . . | 93 | 10 | 103 |
| 41. Campanulaceæ . . . | 7 | — | 7 | 88. Filices . . . | 30 | — | 30 |
| 42. Vacciniaceæ . . . | I | — | I | 89. Equisetaceæ . . . | 5 | — | 5 |
| 43. Ericaceæ . . . | 5 | — | 5 | 90. Lycopodiaceæ . . . | 3 | — | 3 |
| 44. Plumbagineæ . . . | 3 | — | 3 | 91. Marsileaceæ . . . | I | — | I |
| 45. Primulaceæ . . . | 13 | — | 13 | 92. Characeæ . . . | 12 | — | 12 |
| 46. Oleaceæ . . . | 2 | — | 2 | | | | |
| 47. Apocynaceæ . . . | I | I | 2 | | | | |
| | | | | | | | 1,253 |

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I. UPPER TAMAR DISTRICT

This area lacks homogeneity of character to a sensible degree. Such as they are, its rivers alone would almost warrant a cutting up of the district into smaller sections, while the quick changes of sylvan and moorland scenery, arable and waste land impart an indescribable charm to the country. Its geology has similar ranges. In a large measure the division is a great hollow between the Devon and Cornish heights. On the north it has a coast line extending from Devon to Tintagel Head. Its eastern boundary is Devon as far south as where the Launceston road crosses the Tamar near Polston. The southern limit is marked by the high road from Launceston to Bodmin as far as Altarnun, where it follows a narrower road across the moors, past the hut circles under Leskernick Hill. Thence the line runs north, on the east of Brown Willy to Oldpark and Newpark, beyond which it takes the road across Davidstow Moor to the Camelford-Stratton road. From this point it goes to a little beyond Davidstow, and then follows the road to Tintagel Head. Included in this district are the rivers Strat and Valencey, flowing to the north coast, and the source of the Tamar, with its tributaries the Attery, Inny, and Kensey. The greater portion is drained by the Attery. Near the sister county it is well wooded, but as the Bodmin Moors are approached the country takes on a wild and desolate appearance. From Stratton to Launceston there is much low ground, corresponding generally with river ramifications.

A large slice of this area is composed of Upper Devonian rocks enclosing bands of greenstone or metamorphosed siliceous slate mixed with argillaceous beds of a particularly fine and hard nature. Towards Tintagel and Egloskerry these rocks impinge the Lower Devonian which sweep around the Bodmin Granite Boss. A limited part of the north-east of the division is occupied by the grits and shales of the Carboniferous system.

Until the 'seventies' the flora of this district was an unknown quantity, but thanks to the industry of the Rev. W. Moyle Rogers, Dr. Hind, Messrs. Briggs and Wise cosmos has replaced chaos. The sandy shore between Stratton and Bude is the classic spot mentioned by Merrett for *Mathiola sinuata*, the only place in the county where it has been found. It disappeared a long time ago. Tintagel by some mistake has been credited with *Trifolium squamosum*. *T. arvense* was the plant meant. In the Valley of Rocks, near Trebarwith, *Impatiens Roylei* and *Mimulus Langsdorffii* have become naturalized, and in some seasons present a striking appearance. *Erysimum repandum* has long obtained permanency near Launceston. Rich in *Rubi*, this district can also claim the distinction of being the only portion of Cornwall where *Vicia Orobus*, *Geum rivale*, *Carum verticillatum*, *Galium sylvestre*, *Galeopsis versicolor*, *Habenaria viridis*, *Potamogeton coloratus*, *Calamagrostis epigeios* and *Equisetum sylvaticum* have been found. *Allium Schænoprasum* at Tintagel and *Cladium jamaicense* at Morwinstow are problems in plant distribution, the only other Cornish district for them being the Lizard.

SPECIES AND VARIETIES WORTH NOTING IN THE UPPER TAMAR DISTRICT ¹

| | | |
|------------------------------|--------------------------------|-------------------------------------|
| Ranunculus Drouetii, Godr. | Diplotaxis tenuifolia, DC. | Genista anglica, Linn. |
| — peltatus, Fries | — muralis, DC. | Trigonella purpurascens, Lam. |
| — Lingua, Linn. | Coronopus didymus, Sm. | Medicago denticulata, Willd. |
| — sardous, Crantz | Thlaspi arvense, Linn. | Melilotus alba, Desv. |
| Caltha palustris, Linn. | Teesdalia nudicaulis, R. Br. | — arvensis, Wallr. |
| Helleborus viridis, Linn. | Crambe maritima, Linn. | Trifolium subterraneum, Linn. |
| — foetidus, Linn. | Viola lactea, Sm. | — scabrum, Linn. |
| Delphinium Ajacis, Reichb. | Polygala oxyptera, Reichb. | — fragiferum, Linn. |
| Papaver somniferum, Linn. | Dianthus Armeria, Linn. | — filiforme, Linn. |
| — hybridum, Linn. | Cerastium quaternellum, Fenzl. | Lotus tenuis, Waldst. & Kit. |
| Meconopsis cambrica, Vig. | Buda rupestris | — hispidus, Desf. |
| Glaucium flavum, Crantz | Hypericum calycinum, Linn. | Lathyrus Aphaca, Linn. |
| Neckeria lutea, Scop. | — dubium, Leers. | — sylvestris, Linn. |
| — claviculata, N. E. Br. | — undulatum, Schousb. | Spiræa salicifolia, Linn. |
| Barbarea præcox, R. Br. | Geranium sanguineum, Linn. | Rubus suberectus, Anders. |
| Alyssum maritimum, Linn. | — phæum, Linn. | — plicatus, W. & N. |
| Erophila præcox, DC. | — pratense, Linn. | — imbricatus, Hort. |
| Cochlearia anglica, Linn. | — pyrenaicum, Burm. fil. | — pulcherrimus, Neum. |
| Sisymbrium Thalianum, J. Gay | — rotundifolium, Linn. | — villicaulis var. Selmeri (Lindb.) |
| — Sophia, Linn. | — lucidum, Linn. | |
| Camelina sativa, Crantz | Erodium moschatum, L'Hérit. | — pubescens, Weibe |
| Brassica alba, Boiss. | — maritimum, L'Hérit. | — micans, Gren. & Godr. |

¹ Non-native plants are printed in italics.

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- Rubus mucronatus*, *Blox.*
 — *anglosaxonicus*, *Gelert.*
 — *Borreri*, *Bell Salt*, var. *dentatifolius*, *Briggs*
 — *echinatus*, *Lindl.*
 — *longithyriger*, *Bab.*
 — *plinthostylus*, *Genev.*
 — *hirtus*, *W. & K.*
 — *Balfourianus*, *Blox.*
Alchemilla vulgaris, *Linn.*
Agrimonia odorata, *Mill.*
Rosa obtusifolia, *Desv.*
 — *stylosa*, *Desv.*
Pyrus torminalis, *Ehrh.*
 — *rotundifolia*, *Bechst.*
 — *germanica*, *Hook. fil.*
Bryonia dioica, *Jacq.*
Eryngium maritimum, *Linn.*
 — *campestre*, *Linn.*
Physospermum commutatum,
Spreng.
Sison Amomum, *Linn.*
Pimpinella major, *Huds.*
Adoxa Moschatellina, *Linn.*
Sambucus Ebulus, *Linn.*
Valeriana Mikanii, *Willd.*
Valerianella carinata, *Loisel.*
 — *rimosa*, *Bast.*
Scabiosa Columbaria, *Linn.*
Aster Tripolium, *Linn.*
Erigeron acre, *Linn.*
Inula crithmoides, *Linn.*
Anthemis arvensis, *Linn.*
Matricaria Chamomilla, *Linn.*
Senecio crucifolius, *Linn.*
Arctium majus, *Bernh.*
Cnicus pratensis, *Willd.*
 — *acaulis*, *Willd.*
Mariana lactea, *Hill.*
Crepis taraxacifolia, *Thuill.*
 — *biennis*, *Linn.*
Hieracium aurantiacum, *Linn.*
 — *rigidum*, *Hartm.*
Tragopogon pratense, *Linn.*
Campanula rotundifolia, *Linn.*
Statice auriculæfolia, *Vahl.*
Primula veris, *Linn.*
Anagallis cærulea, *Schreb.*
Blackstonia perfoliata, *Huds.*
Gentiana Amarella, *Linn.*
 — *campestris*, *Linn.*
Verbascum Blattaria, *Linn.*
Sibthorpia europæa, *Linn.*
Bartsia viscosa, *Linn.*
Orobanche major, *Linn.*
 — *minor*, *Sm.*
Pinguicula lusitanica, *Linn.*
Nepeta Cataria, *Linn.*
Melittis Melissophyllum, *Linn.*
Leonurus Cardiacæ, *Linn.*
Chenopodium polyspermum, *Linn.*
 — *murale*, *Linn.*
Polygonum minus, *Huds.*
 — *Bistorta*, *Linn.*
Fagopyrum esculentum, *Mænech*
Daphne Laureola, *Linn.*
Euphorbia Paralias, *Linn.*
 — *portlandica*, *Linn.*
Elodea canadensis, *Michx.*
Neottia Nidus-avis, *Rich.*
Epipactis latifolia, *All.*
Orchis incarnata, *Linn.*
Ruscus aculeatus, *Linn.*
Polygonatum multiflorum, *All.*
Convallaria majalis, *Linn.*
Allium Ampeloprasum, *Linn.*, var.
Babingtonii (*Borr.*)
Scilla autumnalis, *Linn.*
 — *verna*, *Huds.*
Ornithogalum umbellatum, *Linn.*
Typha latifolia, *Linn.*
Potamogeton crispus, *Linn.*
Zostera marina, *Linn.*
Scirpus sylvaticus, *Linn.*
Eriophorum vaginatum, *Linn.*
 — *latifolium*, *Hoppe.*
Rynchospora alba, *Vahl.*
Carex pallescens, *Linn.*
 — *distans*, *Linn.*
 — *fulva*, *Good.*
Setaria viridis, *Beauv.*
Alopecurus myosuroides, *Huds.*
Phleum arenarium, *Linn.*
Gastridium australe, *Beauv.*
Koeleria cristata, *Pers.*
Glyceria plicata, *Fr.*
 — *maritima*, *Mert. & Koch.*
Festuca sylvatica, *Vill.*
Lolium temulentum, *Linn.*
Lepturus filiformis, *Trin.*
Hymenophyllum tunbridgense, *Sm.*
 — *unilaterale*, *Bory.*
Asplenium lanceolatum, *Huds.*
Ceterach officinarum, *Willd.*
Cystopteris fragilis, *Bernh.*
Phegopteris Dryopteris, *Fée*
Ophioglossum vulgatum, *Linn.*
Botrychium Lunaria, *Sw.*
Lycopodium clavatum, *Linn.*
Chara fragilis, *Desv.*
Nitella flexilis, *Agardh*
 — *opaca*, *Agardh*

2. LOWER TAMAR DISTRICT

On the east this division is bounded by Devon, on the south by the English Channel, on the west by the several roads running from Downderry to Trenodden, Pengover Green, Wayland, Upton and Henwood. A little beyond the latter place the line passes across Twelve Men's and East Moors and joins the Bodmin-Launceston road above Cannafraime. Its northern boundary is the Upper Tamar District.

The exquisite beauty of this section of the county is too well known to call for lengthy notice here. Its valleys and glens court comparison with the best in the west of England; its parks are almost unrivalled, Mount Edgcumbe, Antony, Port Eliot, Pentillie and Trebartha Hall being but a few of the beauty-spots. The only elevations of any significance are Kit Hill, 1,088 feet, and Trebartha Tor, 1,029 feet. From their summits extensive views may be had of a softly undulating country made up of a mosaic of sylvan, moorland, and upland wealth peculiar to that portion of Cornwall lying south of the backbone. The valleys through which the Tamar, Lynher and Tidy have cut their way are deep and well wooded, in many places remarkably sinuous and with precipitous banks. In its eastern part this division is drained by the Tamar and its tributary the Inny, and in the west by the Lynher and Tidy, both of which rise just within the border-line. Between the Lynher and the Tamar there is a good deal of hilly country stretching from below Callington to Lewannick on the fringe of the Upper Tamar District. From the foot of these hills proceed the numerous feeders of the Lynher. From Pensilva to Cannafraime the upper portion of the western division-line crosses a wild part of the eastern escarpment of the Bodmin Moors, amid such elevations as the Caradon Hills and Smallacoombe Downs on the one side and Hawks Tor and Trebartha Tor on the other.

Launceston stands on a continuation of the Upper Devonian rocks noticed when dealing

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with the Upper Tamar District. At South Petherwin the Lower Devonian are exposed and occupy the greater part of this district. West of the Lynher a small portion of the Bodmin Granite Boss is included; on a much smaller scale the same rock appears at Kit Hill and Gunnislake. At Torpoint, and on the coast a little to the west of Rame Head, small patches of limestone of an inferior character crop out from the argillaceous slates. They are very restricted both superficially and in depth, and certainly have no appreciable influence on the flora. Beds of greenstone and trappean rock traverse the Upper and Lower Devonian systems, while the granite and the Lower Devonian encircling it are intersected by short elvan courses running from east to west.

As might be expected from a consideration of its physical features this slice of the county offers many attractions to botanists. *Rubi* are represented here more largely than in any other part of Cornwall, the result in a great measure of the good work of Mr. Briggs. *Ranunculus auricomus*, *R. arvensis*, *Viola ericetorum*, *Silene noctiflora*, *Trifolium glomeratum*, *T. agrarium*, *Lathyrus sylvestris*, *Sedum album*, *Pimpinella major*, *Specularia hybrida*, *Linaria purpurea*, *Zostera nana*, all rare in other parts of Cornwall, have been gathered in the lower half of this district. In the upper half *Physospermum commutatum* stretches right across the country from Halton Quay on the Tamar to the western boundary-line. *Sisymbrium Thalianum*, not recorded from west of Bodmin, is common on walls and dry banks around Torpoint and Rame, and *Hypericum undulatum* occurs in most marshy places. On the dry slopes above Whitsand Bay *Lotus angustissimus* and *L. hispidus* keep each other company, the latter being the more abundant. Along the banks of the river at St. Germans and Tideford large cushions of *Atriplex portulacoides* are scattered over the beds of *Salicornia herbacea* and *Suaeda maritima*. Sandy soil near Notter Bridge gives a home to *Scirpus sylvaticus*, and in a large marsh on the left bank of the Tidy just below Tideford, as well as in a salt marsh at Cotehele and a mud-flat below Danescombe, on the Tamar, *Alopecurus bulbosus* is very abundant. The muddy banks of the Tamar between Calstock and Morwellham is the one tract in Cornwall where grow *Scirpus triqueter* and *C. carinatus*. The following are also unrecorded for any other county division: *Viola odorata* × *hirta*, *Rubus erythrinus*, *R. gratus*, *R. silvaticus*, *R. Boræanus*, *R. thyrsiger*, *Crepis nicaensis*, *Campanula Trachelium*, *Atropa Belladonna*.

Until recorded from this district in 1870 by Mr. Briggs, *Pyrus cordata* was not known as a British plant. *Orobanche amethystea* was also added to the British flora in 1845 by its discovery along Whitsand Bay by Rev. C. A. Johns. Attention is directed to the fact that five broomrapes have been found in a small area in this division.

A damp meadow near Weir Head furnishes a luxuriant crop of *Poterium officinale*. Occurring but sparsely west of this division until the Lizard peninsula is reached its presence by the Tamar in such profusion is a matter of considerable interest. *Vicia lutea*, *Spiræa Filipendula* and *Orobanche rubra*, three other well known Lizard plants, crop up here also.

Jacob's *West Devon and Cornwall Flora* (1837) mentions *Nasturtium palustre* for the banks of the Lynher and *Polycarpon tetraphyllum* for Port Wrinkle, but both plants have long disappeared from the district. *Euphorbia Peplis* was last seen on Seaton sands by Mr. F. P. Pascoe in 1847, and *E. platyphyllos* known to grow at Torpoint in 1842 long ago took its departure. Whether erroneously recorded or whether it has died out is difficult to say, but no one appears to have seen *Trifolium suffocatum* at Crafhole since Jones placed it on record in his *Botanical Tour* (1820). Quite rightly we think did Mr. Briggs warmly inveigh against the ruthless collecting of certain grabbers whereby Cornwall was robbed of its only patch of *Potentilla argentea*. It was found by Mr. Briggs at Trevol in 1865 and continued in occupation of the spot until 1878, when it was entirely lost sight of.

SPECIES AND VARIETIES WORTH NOTING IN THE LOWER TAMAR DISTRICT

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| <i>Helleborus viridis</i> , Linn. | <i>Brassica oleracea</i> , Linn. | <i>Dianthus Armeria</i> , Linn. |
| <i>Berberis vulgaris</i> , Linn. | — <i>alba</i> , Boiss | <i>Stellaria umbrosa</i> , Opiz. |
| <i>Papaver hybridum</i> , Linn. | <i>Diploxis muralis</i> , DC. | <i>Buda rupestris</i> |
| <i>Meconopsis cambrica</i> , Vig. | <i>Lepidium rudemale</i> , Linn. | <i>Hypericum hircinum</i> , Linn. |
| <i>Glaucium flavum</i> , Crantz | — <i>campestre</i> , R. Br. | — <i>calycinum</i> , Linn. |
| <i>Neckera lutea</i> , Scop. | <i>Thlaspi arvense</i> , Linn. | — <i>dubium</i> , Leers |
| — <i>claviculata</i> , N. E. Br. | <i>Teesdalia nudicaulis</i> , R. Br. | — <i>montanum</i> , Linn. |
| <i>Barbarea intermedia</i> , Boreau | <i>Cakile maritima</i> , Scop. | <i>Malva pusilla</i> , Sm. |
| <i>Erophila præcox</i> , DC. | <i>Raphanus Raphanistrum</i> , Linn. | <i>Linum usitatissimum</i> , Linn. |
| <i>Cochlearia anglica</i> , Linn. | — <i>maritimus</i> , Sm. | <i>Geranium striatum</i> , Linn. |
| <i>Erysimum cheiranthoides</i> , Linn. | <i>Polygala oxyptera</i> , Reichb. | — <i>pyrenaicum</i> , Burm. fil. |

BOTANY

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| <p> <i>Geranium pusillum</i>, Linn. — <i>rotundifolium</i>, Linn. — <i>lucidum</i>, Linn. <i>Erodium moschatum</i>, L'Hérit. — <i>maritimum</i>, L'Hérit. <i>Oxalis corniculata</i>, Linn. <i>Medicago denticulata</i>, Willd. <i>Melilotus alba</i>, Desr. — <i>arvensis</i>, Wallr. <i>Trifolium scabrum</i>, Linn. <i>Rubus suberectus</i>, Anders. — <i>plicatus</i>, W. & N. — <i>affinis</i>, W. & N., var. <i>Briggsianus</i>, Rogers — <i>imbricatus</i>, Hort. — <i>incurvatus</i>, Bab. — <i>dumnoniensis</i>, Bab. — <i>villicaulis</i> var. <i>Selmeri</i> (Lindb.) — <i>leucandrus</i>, Focke — <i>ramosus</i>, Briggs — <i>mucronatus</i>, Blox. — <i>anglosaxonicus</i>, Gelert — <i>Leyanus</i>, Rogers — <i>echinatus</i>, Lindl. — <i>oigoclados</i>, Muell & Lefv. — <i>longithyriger</i>, Bab. — <i>Balfourianus</i>, Blox. <i>Agrimonia odorata</i>, Mill. <i>Pyrus germanica</i>, Hook. fil. <i>Myriophyllum spicatum</i>, Linn. <i>Epilobium lanceolatum</i>, Seb. & Maur. <i>Eryngium maritimum</i>, Linn. <i>Carum Carvi</i>, Linn. <i>Sison Amomum</i>, Linn. <i>Anthriscus vulgaris</i>, Bernb. </p> | <p> <i>Cornus sanguinea</i>, Linn. <i>Adoxa Moschatellina</i>, Linn. <i>Valerianella eriocarpa</i>, Desv. — <i>carinata</i>, Loisel. — <i>rimosa</i>, Bast. <i>Filago minima</i>, Fr. <i>Antennaria dioica</i>, R. Br. <i>Inula Helenium</i>, Linn. — <i>crithmoides</i>, Linn. <i>Senecio erucifolius</i>, Linn. <i>Arctium majus</i>, Bernb. <i>Crepis taraxacifolia</i>, Thuill. — <i>biennis</i>, Linn. <i>Tragopogon pratense</i>, Linn. <i>Campanula rotundifolia</i>, Linn. <i>Statice auriculæfolia</i>, Vahl. <i>Primula veris</i>, Linn. <i>Lithospermum arvense</i>, Linn. <i>Cuscuta Trifolii</i>, Bab. <i>Lycium barbarum</i>, Linn. <i>Verbascum Blattaria</i>, Linn. <i>Linaria spuria</i>, Mill. <i>Sibthorpia europæa</i>, Linn. <i>Bartsia viscosa</i>, Linn. <i>Orobancha major</i>, Linn. — <i>Hederæ</i>, Duby — <i>minor</i>, Sm. <i>Pinguicula lusitanica</i>, Linn. <i>Mentha gentilis</i>, Linn. <i>Thymus Chamædrys</i>, Fr. <i>Nepeta Cataria</i>, Linn. <i>Melittis Melissophyllum</i>, Linn. <i>Leonurus Cardiaca</i>, Linn. <i>Lamium hybridum</i>, Vill. — <i>Galeobdolon</i>, Crantz <i>Chenopodium Vulvaria</i>, Linn. — <i>murale</i>, Linn. </p> | <p> <i>Polygonum Raii</i>, Bab. — <i>maculatum</i>, Trim. & Dyer — <i>Bistorta</i>, Linn. <i>Rumex rupestris</i>, Le Gall. <i>Daphne Laureola</i>, Linn. <i>Euphorbia Paralias</i>, Linn. — <i>portlandica</i>, Linn. <i>Neottia Nidus-avis</i>, Rich. <i>Epipactis latifolia</i>, All. <i>Narcissus biflorus</i>, Curtis <i>Galanthus nivalis</i>, Linn. <i>Ruscus aculeatus</i>, Linn. <i>Ornithogalum umbellatum</i>, Linn. <i>Juncus squarrosus</i>, Linn. <i>Luzula Forsteri</i>, DC. <i>Typha angustifolia</i>, Linn. <i>Eleocharis multicaulis</i>, Sm. <i>Scirpus sylvaticus</i>, Linn. <i>Carex divulsa</i>, Good. — <i>pallescens</i>, Linn. — <i>vesicaria</i>, Linn. <i>Setaria viridis</i>, Beauv. <i>Alopecurus bulbosus</i>, Gouan. <i>Milium effusum</i>, Linn. <i>Gastridium australe</i>, Beauv. <i>Catabrosa aquatica</i>, Beauv. <i>Briza minor</i>, Linn. <i>Poa compressa</i>, Linn. <i>Glyceria distans</i>, Wahlenb. <i>Festuca procumbens</i>, Kunth. <i>Lepturus filiformis</i>, Trin. <i>Hymenophyllum unilaterale</i>, Bory <i>Ceterach officinarum</i>, Willd. <i>Lycopodium clavatum</i>, Linn. <i>Nitella opaca</i>, Agardh </p> |
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3. FOWEY DISTRICT

Having for its eastern boundary the Lower Tamar District, for its southern a much broken and for the most part precipitous coast line ranging from Downderry to Pentewan, for its western the high road from Pentewan through St. Austell, Ruddle Moor, and Roche, to the five turnings a mile or so beyond the latter village, and for its northern the road from the five turnings mentioned through St. Ingunger, Lanhydrock, Bodmin, Cardinham Downs and Bolventor, to Poldew, this division repeats most of the physical features so markedly noticeable in the two districts already described. It is essentially a district of woods and romantic valleys, and an ideal hunting-ground for the botanist. Along their upper parts the valleys through which the Fowey, Looe and Seaton rivers flow offer nothing of startling importance, but as the estuaries are reached a considerable variety of plants will be found, not a few of them being among the rarest in the British flora. Save the north-east, which includes a goodly portion of the Bodmin Moors and the Caradon Hills, and a small corner of Hensbarrow Hill, in the west, this piece of Cornwall rarely rises above 600 feet. On the whole its flora has much in common with that of the Channel Islands and north France.

From the eastern limits of this district to about 2 miles west of the common estuary of the two Looe rivers Lower Devonian rocks occur. Upper Silurian become visible a little to the west of the Hore Stone, and join the Lower Silurian in an almost straight line to about midway between Lostwithiel and Bodmin. A small exposure of the same rocks is again met skirting St. Austell Bay, terminating with Black Head. West of the Upper Silurian the Hensbarrow Granite Boss rises through an almost perfect belt of Lower Silurian to an elevation of 1,026 feet. At Clicker Tor, between Menheniot and the coast, there is a limited outcrop of magnesian rocks analogous in character with those of the Lizard District *Erica vagans*, a glorious feature of the Goonhilly Downs, has been reported from the Menheniot

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rocks, but the record is a very old one, and the indigeneity of the heath has been frequently discussed.

Although the plants which are confined to this part of Cornwall are not so numerous as can be cited for some of the other seven districts, they form an interesting group. *Nasturtium palustre*, once found along the banks of the Tamar, and at Copperhouse near Hayle, is now believed to be restricted to a very circumscribed area near Lostwithiel. *Brassica Cheiranthus* simply abounds at Par and Pentewan, and stretches away in scattered patches and single plants several miles from the two centres. Since it was first noticed at Pentewan more than fifty years ago as a straggler, it has seized on hedge-banks, waste-heaps, blown sand and pasture land to an astonishing extent. Between Par Sation and Fowey Point *Silene Armeria* occupies the hedges and sandhills at intervals over fifteen miles of country. This announcement was made thirty years and more ago, and like many another species which has immigrated to that part of the coast from the continent, the plant has settled on the soil. Two localities are known for *Eryngium campestre*, each having two thriving colonies of plants. Near the Looe locality *Cenanthe silaifolia* grows in tolerable quantity, and here only in the whole county. Twenty-four years ago *Lobelia urens* was accidentally discovered between Polperro and Fowey, the find bringing Cornwall into touch with Devon. To the remoteness from the track of the average plant grabber of the two damp places where it grows must be attributed the power of the plant to hold its own and even to increase its numbers. Hayle at one time shared with St. Blazey Bay the honour of being the only bits of Cornish soil where *Linaria supina* grew. While disappearing from the western town many years ago, it is busy extending its borders in the district now under notice. Around Par village it is the commonest weed, and along the roadsides two or three miles away dozens of wanderers may be found every autumn. Like most 'colonists' with a predilection for sandy soil, it is taking advantage of the railway as a means of transit, and has already migrated to such distant parts as Fowey and Menheniot. From near Fowey *Romulea Columnæ* and *Juncus tenuis* have been recorded to the present writer and voucher specimens submitted. A very recent addition to the flora of Cornwall and indeed to the flora of Great Britain is *Bromus rigidus*, found in 1901 at Par by Mr. A. O. Hume. Whatever may be the means whereby it reached that locality, or how long since, it has established itself beyond fear of early disappearance.

This district marks the most western occurrence of *Meconopsis cambrica*, *Stellaria umbrosa* and *Atriplex portulacoides*. East of it *Apium inundatum*, a very common plant in many parts of mid and west Cornwall, and *Epipactis palustris* have not been found. It furnishes three of the five British *Lycopods*, but is unaccountably barren in *Charas*. On the elevated moors *Carex dioica*, *C. curta*, *C. rostrata*, *Eriophorum vaginatum* and *E. latifolium* may be sought for. *Carex diluta* has a home on the cliffs near Charlestown, and *C. acutiformis* is associated with other riparian subjects at the head of the West Looe river.

The visitor to Par on botanical intent will be struck by the number of aliens which there find shelter. Perhaps the most interesting among them are *Lepidium virginicum*, *Coronilla varia*, *Aster Novi-Belgii*, *Matricaria discoidea*, and *Cannabis sativa*. In the East Looe valley, above Sandplace, *Impatiens Roylei* has become naturalized to a degree. No finer sight can be conceived than the thousands of luxuriant full-flowered plants standing 7 feet and more out of the streams and damp ground. Near Lostwithiel *Mimulus Langsdorffii* has filled a ditch along one side of a meadow, and affords a splendid picture when in bloom.

SPECIES AND VARIETIES WORTH NOTING IN THE FOWEY DISTRICT

Ranunculus trichophyllus, *Chaix*
— *Baudotii*, *Godr.*, var. *confusus*
(*Godr.*)
— *tripartitus*, *DC.*
— *Lingua*, *Linn.*
Helleborus viridis, *Linn.*
— *foetidus*, *Linn.*
Delphinium Ajacis, *Reichb.*
Fumaria muralis, *Sonder*
Nasturtium sylvestre, *R. Br.*
Barbarea intermedia, *Boreau*
Alyssum incanum, *Linn.*
— *maritimum*, *Linn.*
Sisymbrium Thalianum, *J. Gay*
Brassica oleracea, *Linn.*

Diplotaxis tenuifolia, *DC.*
— *muralis*, *DC.*
Lepidium rudemale, *Linn.*
— *campestre*, *R. Br.*
— *Draba*, *Linn.*
Iberis amara, *Linn.*
Teesdalia nudicaulis, *R. Br.*
Reseda lutea, *Linn.*
Viola hirta, *Linn.*
— *lactea*, *Sm.*
Dianthus Armeria, *Linn.*
Cerastium quaternellum, *Fenzl.*
Stellaria umbrosa, *Opiz.*
Hypericum dubium, *Leers*
— *undulatum*, *Schousb.*

Malva parviflora, *Linn.*
Geranium striatum, *Linn.*
— *pbæum*, *Linn.*
— *pratense*, *Linn.*
— *rotundifolium*, *Linn.*
Erodium moschatum, *L'Hérit.*
— *maritimum*, *L'Hérit.*
Oxalis corniculata, *Linn.*
Medicago denticulata, *Willd.*
Melilotus alba, *Desr.*
— *arvensis*, *Wallr.*
Trifolium subterraneum, *Linn.*
— *scabrum*, *Linn.*
— *glomeratum*, *Linn.*
Lotus angustissimus, *Linn.*

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- Lotus hispidus*, Desf.
Lathyrus Aphaca, Linn.
 — *latifolius*, Linn.
 — *sylvestris*, Linn.
Spiræa salicifolia, Linn.
Rubus pulcherrimus, Neum.
 — *villicaulis* var. *Selmeri* (Lindb.)
 — *leucandrus*, Focke
 — *micans*, Gren. & Godr.
 — *radula* var. *anglicanus*, Rogers
 — *longithyriger*, Bab.
Alchemilla vulgaris, Linn.
Agrimonia odorata, Mill.
Poterium polygamum, Waldst. & Kit.
Pyrus cordata, Desv.
 — *germanica*, Hook. fil.
Epilobium lanceolatum, Seb. & Maur.
Carum Petroselinum, Benth. & Hook. fil.
 — *segetum*, Benth. & Hook. fil.
Sison Amomum, Linn.
Peucedanum sativum, Benth. & Hook. fil.
Adoxa Moschatellina, Linn.
Sambucus Ebulus, Linn.
Valeriana dioica, Linn.
Valerianella rimosa, Bast.
Filago minima, Fr.
Antennaria dioica, R. Br.
Inula Conyza, DC.
- Senecio crucifolius*, Linn.
Arctium intermedium, Lange.
Crepis taraxacifolia, Thuill.
 — *biennis*, Linn.
Lactuca Scariola, Linn., var. *dubia*, Ford.
Specularia hybrida, A. DC.
Blackstonia perfoliata, Huds.
Anchusa officinalis, Linn.
Volulus Soldanella, Junger.
Cuscuta Trifolii, Bab.
Lycium barbarum, Linn.
Verbascum virgatum, Stokes
 — *Blattaria*, Linn.
Linaria supina, Desf.
 — *repens*, Mill.
Scrophularia Scorodonia, Linn.
Veronica Anagallis-aquatica, Linn.
Bartsia viscosa, Linn.
Orobanche major, Linn.
 — *amethystea*, Thuill.
Utricularia neglecta, Lehm.
 — *minor*, Linn.
Origanum vulgare, Linn.
Melissa officinalis, Linn.
Melittis Melissophyllum, Linn.
Marrubium vulgare, Linn.
Lamium Galeobdolon, Crantz
Chenopodium murale, Linn.
 — *rubrum*, Linn.
 — *Bonus-Henricus*, Linn.
Atriplex littoralis, Linn.
- Polygonum Convolvulus*, Linn., var. *subalatum*, V. Hall.
 — *minus*, Huds.
 — *Bistorta*, Linn.
Euphorbia Paralias, Linn.
Mercurialis annua, Linn.
Listera ovata, R. Br.
Orchis Morio, Linn.
Habenaria conopsea, Benth.
 — *bifolia*, R. Br.
 — *chloroleuca*, Ridley
Leucojum æstivum, Linn.
Ruscus aculeatus, Linn.
Convallaria majalis, Linn.
Ornithogalum umbellatum, Linn.
Lilium pyrenaicum, Gouan.
Potamogeton crispus, Linn.
Ruppia rostellata, Koch
Zannichellia pedunculata, Reichb.
Scirpus maritimus, Linn., var. *monostachys*, Sond.
Rynchospora alba, Vahl.
Carex vesicaria, Linn.
Deschampsia flexuosa, Trin
Poa Chaixii, Vill.
Glyceria maritima, Mert. & Koch
 — *distans*, Wahlenb.
Bromus madritensis, Linn.
 — *rigidus*, Koch
Cystopteris fragilis, Bernh.
Lycopodium Selago, Linn.
 — *inundatum*, Linn.
 — *clavatum*, Linn.

4. CAMEL DISTRICT

On its eastern and southern sides this district is coterminous with the Upper Tamar and Fowey Districts. Its coast line lies between Tintagel Head and Padstow, but does not include any portion of the northern side of the Camel estuary outside of Padstow town. The road from Padstow to Winnard's Perch, through St. Columb Major to Blue Anchor, is the western boundary, and the Mitchell-Bodmin road from Blue Anchor to the north-western corner of the Fowey District completes the southern line.

By far the greater portion of this district is occupied by Devonian rocks. From Padstow towards Port Isaac the lowermost of the series prevail. Upper Devonian overlie these as Camelford is neared. At Blisland Lower Silurian abut on the granite of the western side of the Bodmin Moors and narrow away to Wadebridge on one side, and to Bodmin on the other. From the Lower Devonian between Padstow and Fraddon two bosses of granite arise at Castle-an-Dinas; another outcrop is exposed at St. Columb.

If for botanical purposes river-basins are to be accepted as the most satisfactory of county divisions, this district of the eight into which Cornwall has been marked off for the purpose of this paper is least open to criticism. East and west it is drained by the Camel and its tributaries and has no other river or stream of any consequence within its boundary. The Camel itself rises in the parish of Davidstow and with its numerous feeders great and small drains the whole of the north-east. One of its branches, the Lank, drains the Bodmin Moors, starting from between Rough Tor and Brown Willy, not far from the origin of the Fowey. Another, the Alan, has its source between Camelford and Delabole Station and pursues an almost straight course to the parent stream, which it joins at Egloshayle.

From Pentire Point to St. Tudy and from Wadebridge to Lanivet there are long stretches of low-lying ground, and it has been repeatedly remarked by botanists that the flora of these tracts is distinctly sub-maritime. In the extreme east the country rises to altitudes not reached in any other part of the county. Brown Willy, the giant of Cornwall, rises to 1,375 feet; Rough Tor, 1,296; Hawk's Tor, 1,005; Alex Tor, 860. In the west St. Breock Down has an elevation of 739 feet and Castle-an-Dinas 702 feet. Up the several valleys of the

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Camel the scenery is extremely beautiful, and offers marked contrast to the barren character of the neighbouring moors and the rugged features of the distant coast.

This district has received very much attention at the hands of botanists. Messrs. J. G. and E. G. Baker have thoroughly explored and reported on the coast flora from Boscastle to Port Isaac and inland to Camelford. St. Minver parish has been closely scoured by Mr. Darell, who has recently published a complete list of plants occurring there. Mr. Briggs spent several holidays in the parish of Blisland and did good work in connection with the Brambles and Roses of the Camel valley. Finally Mr. R. V. Tellam has taken a roving commission, and with that enthusiasm which has been an outstanding feature of his botanical work has searched out many good things from Bodmin to Brown Willy and Padstow Bay.

Few are the distinctly local plants to be found here. Remarkable also is it that throughout this extensive and favoured portion of the county *Glyceria Borreri* and *Elymus arenarius* are the only plants which have not yet been reported from one of the other seven districts. *Stellaria aquatica*, *Arenaria verna*, *Trifolium strictum* and *Elymus arenarius* grow in the parish of St. Minver. *Meconopsis cambrica* affects a place or two near Camelford, and *Polygala oxyptera* has a limited distribution in the parish of Lanivet. In the Camel valley *Stellaria umbrosa* may be sought for as well as many of the *Rubi* appearing in the subjoined list. Bodmin woods, as every British botanist must know, shelter *Physospermum commutatum*; it was here in fact that it was first discovered on British soil. Along the coast we find the usual maritime flora—*Inula crithmoides*, *Statice auriculæfolia*, *Volvuulus Soldanella*, three *Erodiums*, *Lotus angustissimus*, *L. hispidus*, *Eryngium maritimum*, *Asplenium marinum*.

The marsh above Wadebridge contains the usual riparian plants, which are here cheek-by-jowl with those of littoral predilections. *Cochlearia anglica*, *Trifolium fragiferum*, *Atriplex littoralis*, *Catabrosa aquatica* and *Glyceria distans* are just a few which are worth looking up.

On Tretoil Moor, Lanivet, and at Withiel, *Genista anglica* is sparsely represented. *Pyrus torminalis* and *P. germanica*, both very rare plants farther west, may be said to be general in this district. At Withiel *Cornus sanguinea* takes its most western stand. St. Minver and St. Breock are localities for *Gentiana Amarella*, and Polzeath must be visited for *Allium Ampeloprasum* var. *Babingtonii* and *Cyperus longus*. The downs and wind-swept hills and cliffs are not wanting in *Carices* and even afford such ferns as *Hymenophyllum tunbridgensis*, *H. unilaterale*, *Adiantum Capillus-Veneris*, *Phegopteris Dryopteris*, *P. polypodioides*. On Hustyn Down in our march west we make our first acquaintance with *Pilularia globulifera*. Not many miles distant, at Withiel, *Chara fragilis* may be gathered, while *Nitella translucens* grows at the same place and near Helmentor.

SPECIES AND VARIETIES WORTH NOTING IN THE CAMEL DISTRICT

| | | |
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| <i>Clematis Vitalba</i> , Linn. | <i>Sagina ciliata</i> , Fr. | <i>Rosa canina</i> , Linn., var. <i>dumalis</i> |
| <i>Ranunculus sceleratus</i> , Linn. | — <i>subulata</i> , Presl. | (Bechst.) |
| — <i>sardous</i> , Crantz, var. <i>parvulus</i> | <i>Buda rupestris</i> | — <i>stylosa</i> var. <i>leucochroa</i> (Desv.) |
| (Linn.) | <i>Hypericum dubium</i> , Leers | <i>Epilobium lanceolatum</i> , Seb. & |
| <i>Caltha palustris</i> , Linn., var. <i>Gue-</i> | — <i>undulatum</i> , Schousb. | <i>Maur.</i> |
| <i>rangerii</i> (Boreau) | <i>Malva rotundifolia</i> , Linn. | <i>Anthriscus vulgaris</i> , Hoffm. |
| <i>Helleborus viridis</i> , Linn. | <i>Geranium phœum</i> , Linn. | <i>Fœniculum vulgare</i> , Mill. |
| — <i>foetidus</i> , Linn. | — <i>Robertianum</i> , Linn., var. <i>pur-</i> | <i>Œnanthe Lachenalii</i> , C. Gmel. |
| <i>Aconitum Napellus</i> , Linn. | <i>pureum</i> , auct. angl. | <i>Valeriana dioica</i> , Linn. |
| <i>Berberis vulgaris</i> , Linn. | <i>Ononis spinosa</i> , Linn. | <i>Valerianella rimosa</i> , Bast. |
| <i>Papaver Argemone</i> , Linn. | <i>Trigonella purpurascens</i> , Lam. | <i>Aster Tripolium</i> , Linn. |
| — <i>hybridum</i> , Linn. | <i>Medicago denticulata</i> , Willd. | <i>Erigeron acre</i> , Linn. |
| <i>Neckeria lutea</i> , Scop. | <i>Trifolium subterraneum</i> , Linn. | <i>Filago minima</i> , Fr. |
| — <i>claviculata</i> , N. E. Br. | — <i>scabrum</i> , Linn. | <i>Antennaria dioica</i> , R. Br. |
| <i>Arabis hirsuta</i> , Scop. | <i>Ornithopus perpusillus</i> , Linn. | <i>Inula Conyza</i> , DC. |
| <i>Sisymbrium Thalianum</i> , J. Gay | <i>Rubus suberectus</i> , Anders. | <i>Anthemis Cotula</i> , Linn. |
| <i>Brassica alba</i> , Boiss. | — <i>rhamnifolius</i> , W. & N. | <i>Matricaria Chamomilla</i> , Linn. |
| <i>Coronopus didymus</i> , Sm. | — <i>pulcherrimus</i> , Neum. | <i>Carduus crispus</i> , Linn. |
| — <i>Ruellii</i> , All. | — <i>leucandrus</i> , Focke | <i>Picris hieracioides</i> , Linn. |
| <i>Raphanus maritimus</i> , Sm. | — <i>micans</i> , Gren. & Godr. | <i>Crepis taraxacifolia</i> , Thuill. |
| <i>Reseda lutea</i> , Linn. | — <i>leucostachys</i> , Schleich. | <i>Tragopogon pratense</i> , Linn. |
| <i>Viola hirta</i> , Linn. | — <i>longithrysiger</i> , Bab. | <i>Specularia hybrida</i> , A. DC. |
| — <i>lactea</i> , Sm. | <i>Potentilla procumbens</i> , Sibth. | <i>Primula veris</i> , Linn. |
| <i>Cerastium quaternellum</i> , Fenzl. | <i>Agrimonia odorata</i> , Mill. | <i>Glaux maritima</i> , Linn. |
| <i>Sagina maritima</i> , Don., var. <i>densa</i> | <i>Rosa tomentosa</i> , Sm., var. <i>scabrius-</i> | <i>Anagallis cærulea</i> , Schreb. |
| (Ford.) | <i>cula</i> (Sm.) | <i>Centunculus minimus</i> , Linn. |

BOTANY

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| Blackstonia perfoliata, <i>Huds.</i> | Littorella juncea, <i>Berg.</i> | Juncus maritimus, <i>Lam.</i> |
| Gentiana campestris, <i>Linn.</i> | Chenopodium Bonus-Henricus, <i>Linn.</i> | Alisma ranunculoides, <i>Linn.</i> |
| Cynoglossum officinale, <i>Linn.</i> | Suaeda maritima, <i>Dum.</i> | Potamogeton crispus, <i>Linn.</i> |
| Cuscuta <i>Trifolii</i> , <i>Bab.</i> | Polygonum amphibium, <i>Linn.</i> | Scirpus pauciflorus, <i>Lightf.</i> |
| Solanum nigrum, <i>Linn.</i> | Euphorbia Paralias, <i>Linn.</i> | Rynchospora alba, <i>Vabl.</i> |
| Verbascum virgatum, <i>Stokes</i> | — portlandica, <i>Linn.</i> | Carex dioica, <i>Linn.</i> |
| — Blattaria, <i>Linn.</i> | Myrica Gale, <i>Linn.</i> | — disticha, <i>Huds.</i> |
| Linaria viscida, <i>Mænech</i> | Listera ovata, <i>R. Br.</i> | — divulsa, <i>Good.</i> |
| Antirrhinum Orontium, <i>Linn.</i> | Spiranthes autumnalis, <i>Rich.</i> | — curta, <i>Good.</i> |
| Scrophularia Scorodonia, <i>Linn.</i> | Orchis Morio, <i>Linn.</i> | — pallescens, <i>Linn.</i> |
| Sibthorpia europæa, <i>Linn.</i> | — incarnata, <i>Linn.</i> | — fulva, <i>Good.</i> |
| Veronica Anagallis-aquatica, <i>Linn.</i> | Habenaria conopsea, <i>Benth.</i> | — riparia, <i>Curtis</i> |
| Orobancha minor, <i>Sm.</i> | — bifolia, <i>R. Br.</i> | — rostrata, <i>Stokes</i> |
| — amethystea, <i>Thuell.</i> | — chloroleuca, <i>Ridley</i> | Phleum arenarium, <i>Linn.</i> |
| Utricularia minor, <i>Linn.</i> | Narcissus incomparabilis, <i>Mill.</i> | Gastridium australe, <i>Beauv.</i> |
| Mentha gentilis, <i>Linn.</i> | — biflorus, <i>Curtis</i> | Deschampsia flexuosa, <i>Trin.</i> |
| Origanum vulgare, <i>Linn.</i> | — poeticus, <i>Linn.</i> | Poa nemoralis, <i>Linn.</i> |
| Thymus Chamædryas, <i>Fr.</i> | Polygonatum multiflorum, <i>All.</i> | — compressa, <i>Linn.</i> |
| Nepeta Cataria, <i>Linn.</i> | Muscari racemosum, <i>Mill.</i> | Festuca procumbens, <i>Kunth.</i> |
| Scutellaria galericulata, <i>Linn.</i> | Scilla autumnalis, <i>Linn.</i> | — arundinacea, <i>Schreb.</i> |
| — minor, <i>Huds.</i> | — verna, <i>Huds.</i> | Agropyron junceum, <i>Beauv.</i> |
| Melittis Melissophyllum, <i>Linn.</i> | Juncus squarrosus, <i>Linn.</i> | Ceterach officinarum, <i>Willd.</i> |
| Marrubium vulgare, <i>Linn.</i> | — glaucus, <i>Leers</i> | Lycopodium Selago, <i>Linn.</i> |
| Leonurus Cardiaea, <i>Linn.</i> | | Nitella flexilis, <i>Agardh.</i> |

5. NORTH COAST DISTRICT

This takes in a long narrow tract of country at no place more than 7 miles wide, and for a considerable distance little above 3 miles wide. As the crow flies its length from Stepper Point, outside Padstow Harbour, to Hayle is about 33 miles. Its boundary is the road from Padstow through St. Columb to Blue Anchor, forming the western limit of the Camel District. From Blue Anchor the line follows the turnpike road through Mitchell, Zelah, and Scorrier to Redruth. At the mining town of Redruth it takes the Helston road across Buller Downs, turning off at Nine Maidens, and at Praise Station joining the railway line to Hayle.

Geologically this is an interesting district. From Stepper Point to the northern bank of the Gannel at Newquay the soil is Lower Devonian, and the whole of that district has been brought to a fine state of cultivation. West of the Gannel, coastwards from a line drawn from the head of the creek to Perranporth, the country is Upper Silurian intersected by elvan courses and the well known Perran Iron Lode. A little distance from the south bank of the upper waters of the Gannel there are faint traces of a small deposit of limestone. Inland from the line above indicated Lower Silurian cover portions of the parishes of Cubert, Newlyn East, and Perran, while at St. Enoder the district takes in a small portion of the same rocks which form a belt around Hensbarrow Hill. These two patches are separated by a continuation of the Lower Devonian rocks, which sweep around the Perran branch of the Lower Silurian to about Chapel Porth, west of St. Agnes Head. There they are replaced by beds which have been provisionally classed as Cambrian. These are the oldest slates of the county, and in the district under notice, save an unimportant deposit of Lower Silurian west of Portreath, they occupy the coast-line from Chapel Porth to Godrevy. Inland they range to Blackwater and Redruth, sweeping round the western side of Carnmarth and the northern side of Carn Brea Granite Boss to Camborne, in which parish Lower Silurian are again exposed and occupy the remainder of the district.

Here perhaps better than in any other part of the county is one able to institute contrasts between the north and the south coasts. Placing this district against that which is to follow, it will be found poor in those densely wooded valleys which open on the south coast and afford shelter for a rich patchwork flora which has 'been "taken in in numbers" and bound afterwards.' Here and there one happens upon a quiet sylvan oasis watered by a clear stream, but on the whole the district answers to the description of the Devonshire wag who thought Cornwall scarcely grew trees enough to supply timber for coffins for its inhabitants. The downs of this district offer little to the botanist beyond the everyday species of the county; even in the rare weeds of cultivated land it is singularly poor, and where a marsh occurs it is irritatingly restricted and yields few of those plants which are the pride of paludal haunts south of the county's backbone. Its coast flora, with but few exceptions to be presently noticed, is simply a thinning away of that of the Camel and Upper Tamar

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Districts, and although it has long stretches of blown sand offering apparently suitable conditions for many of the species which crown Northam and Braunton Burrows in the neighbouring county, never a trace of them has been found. *Viola Curtisii*, *Teucrium Scordium*, *Epipactis palustris*, *Polygonum maritimum*, *Juncus acutus*, *Scirpus Holoschoenus*, and *Festuca uniglumis* might be expected to occur in some of the grassy hollows of the Towans, but it is quite certain they do not.

Several other surprises will attend the investigations of the botanist in this district. If he commences operations in the spring, and knows anything at all of the flora of the other districts, the way in which the cowslip is distributed from Newquay to Hayle will come as a pleasant discovery. Near Hayle it is one of the features of the meadows, downs and marshes. From Newquay to St. Agnes, that prettiest of heaths, *Erica ciliaris*, infests the waysides and wastrels, the equally charming hybrid *Ciliaris* × *tetralix* keeping it company. At Connor Downs a tongue of the lizard flora, represented by *Erica vagans* and *Spiræa filipendula*, runs out to the sandhills. On downs in the parishes of Cubert, Newlyn, Perranzabuloe, St. Agnes, and Gwinear, *Antennaria dioica* is frequent, and a careful search will be rewarded with *Gentiana campestris*. *G. Amarella* grows east of Newquay and at Porth Towan and Conner on the west, but only very sparingly. From between Padstow and Cubert three interesting Batrachian *Ranunculi* have been reported, viz. *R. trichophyllus*, *R. Drouetii*, *R. Baudotii*.

The most important plants to be met in a coast walk from Padstow to Hayle are: *Papaver Argemone*, *P. hybridum*, *Arabis hirsuta*, *Viola hirta*, *V. lactea*, *Arenaria verna*, *Sagina subulata*, *S. nodosa*, *Geranium sanguineum*, *Genista pilosa*, *Trifolium squamosum*, *T. fragiferum*, *Lotus hispidus*, *Anthriscus vulgaris*, *Inula crithmoides*, *Cnicus acaulis*, *Mariana lactea*, *Statice auriculæfolia*, *Orobanche Hederæ*, *O. amethystea*, *Utricularia vulgaris*, *Mentha pubescens*, *Marrubium vulgare*, *Lamium hybridum*, *Euphorbia Paralias*, *E. portlandica*, *Ruscus aculeatus*, *Scilla autumnalis*, *Scirpus Caricis*, *Phleum arenarium*.

Several instructive object-lessons in plant naturalization are to be found in this district. On the cliffs at Newquay *Mathiola incana*, *Cheiranthus Cheiri*, *Carum Petroselinum*, *Scabiosa maritima* and *Narcissus biflorus* have long been in occupation and are yearly spreading. The churchyard at Mawgan and the Nunnery walls above, as well as the churchyard at Newlyn, and one or two other places, may be counted on every year for a crop of *Hieracium aurantiacum*. Of a different character are *Asperugo procumbens*, *Althæa hirsuta* and *Claytonia perfoliata*, which occur only at uncertain intervals.

In the year 1883 *Euphorbia hiberna* was discovered in a wood at Portreath by Mr. E. D. Marquand, the find being duly recorded in the *Transactions* of Penzance Natural History and Antiquarian Society a year later. Up to that time the only British locality for this spurge was in Devon. More recently still *Filago apiculata* has been discovered in the parishes of St. Columb and Perranzabuloe, and *Cnicus acaulis* on the sandhills at Perranporth.

In the *Botanical Gazette*, 1850, *Astragalus glycyphyllus* was recorded for Cubert and *Vicia bithynica* for Perranzabuloe; but too great stress must not be laid on the accuracy of the statements. Fruitless searches have repeatedly been made for the plants in the parishes named as well as in other parts of the county. The *Phytologist*, 1847, on the authority of Mr. F. P. Pascoe, cites Newquay as a Cornish station for *Lathræa Squamaria*; but three years later, when drawing up his list of Cornish plants for H. C. Watson, Mr. Pascoe made no mention of this parasite. Miss Warren, a very industrious botanist, contributed to the Herbarium of the long defunct Horticultural Society of Cornwall a specimen of *Orobanche elatior*, labelled 'Cubert Porth'; one of *Allium Scorodoprasum* from 'Perran Minor,' and one of *Ceratophyllum submersum* endorsed 'Perranzabuloe.' Unfortunately the specimens are too poor to admit of an opinion at this late date. The broomrape has been found in some of the other county districts, but the garlic and pondweed are without any other record.

SPECIES AND VARIETIES WORTH NOTING IN THE NORTH COAST DISTRICT

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| <i>Delphinium Ajacis</i> , Reichb. | <i>Lepidium Draba</i> , Linn. | <i>Geranium striatum</i> , Linn. |
| <i>Aconitum Napellus</i> , Linn. | <i>Reseda lutea</i> , Linn. | — <i>phæum</i> , Linn. |
| <i>Fumaria Boræi</i> , Jord. | <i>Stellaria umbrosa</i> , Opiz. | <i>Erodium maritimum</i> , L'Hérit. |
| <i>Erophila vulgaris</i> , DC. | <i>Buda rupestris</i> | <i>Genista anglica</i> , Linn. |
| <i>Cochlearia anglica</i> , Linn. | <i>Hypericum dubium</i> , Leers | — <i>tinctoria</i> , Linn. |
| <i>Brassica oleracea</i> , Linn. | — <i>undulatum</i> , Schousb. | <i>Trigonella purpurascens</i> , Lam. |
| <i>Diplotaxis muralis</i> , DC. | <i>Malva rotundifolia</i> , Linn. | <i>Melilotus alba</i> , Desr. |
| <i>Coronopus didymus</i> , Sm. | <i>Linum usitatissimum</i> , Linn. | <i>Trifolium subterraneum</i> , Linn. |
| — <i>Ruellii</i> , All. | <i>Geranium sanguineum</i> , Linn. | — <i>arvense</i> , Linn. |

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Trifolium scabrum, Linn.
Lathyrus sylvestris, Linn.
Potentilla palustris, Scop.
Pyrus torminalis, Ehrh.
Saxifraga tridactylites, Linn.
Sedum reflexum, Linn.
— *rupestre*, Linn.
Eryngium maritimum, Linn.
Carum segetum, Benth. & Hook.
fil.
Pimpinella major, Huds.
Oenanthe Lachenalii, C. Gmel.
Adoxa Moschatellina, Linn.
Valerianella rimosa, Bast.
Erigeron acre, Linn.
Inula Conyza, DC.
Anthemis Cotula, Linn.
Tanacetum vulgare, Linn.
Artemisia Absinthium, Linn.
Doronicum plantagineum, Linn.
Picris hieracioides, Linn.
Crepis taraxacifolia, Thuill.
Campanula rotundifolia, Linn.
Specularia hybrida, A. DC.
Primula veris, Linn.
Anagallis cærulea, Schreb.
Centunculus minimus, Linn.
Microcala filiformis, Hoffm. & Link.
Blackstonia perfoliata, Huds.
Erythraea pulchella, Fr.
Cuscuta Trifolii, Bab.

Lycium barbarum, Linn.
Hyoscyamus niger, Linn.
Verbascum Blattaria, Linn.
Linaria spuria, Mill.
— *supina*, Desf.
— *purpurea*, Mill.
— *repens*, Mill.
Antirrhinum Orontium, Linn.
Scrophularia Scorodonia, Linn.
Sibthorpia europæa, Linn.
Mentha pubescens, Willd., and
var. *hircina* (Hull)
Melissa officinalis, Linn.
Salvia Verbenaca, Linn.
Nepeta Cataria, Linn.
Scutellaria galericulata, Linn.
— *minor*, Huds.
Melittis Melissophyllum, Linn.
Lamium intermedium, Fr.
— *maculatum*, Linn.
— *Galeobdolon*, Crantz
Illecebrum verticillatum, Linn.
Amaranthus retroflexus, Linn.
Chenopodium polyspermum,
Linn.
— *murale*, Linn.
— *urbicum*, Linn., and var. *inter-*
medium, Moq.
Atriplex laciniata, Linn.
— *portulacoides*, Linn.
Salicornia herbacea, Linn.
Suaeda maritima, Dum.

Polygonum Raii, Bab.
Rumex rupestris, Le Gall.
Hippophae rhamnoides, Linn.
Mercurialis annua, Linn.
Salix triandra × *fragilis*
— *aurita* × *viminalis*
Iris foetidissima, Linn.
Allium Ampeloprasum, Linn., var.
Babingtonii (Borr.)
— *triquetrum*, Linn.
Scilla verna, Huds.
Juncus glaucus, Leers
Typha latifolia, Linn.
— *angustifolia*, Linn.
Arum italicum, Mill.
Potamogeton crispus, Linn.
— *pusillus*, Linn., var. *tenuissi-*
mus, Koch
Ruppia spiralis, Hartm.
Zannichellia palustris, Linn.
Cyperus longus, Linn.
— *hirta*, Linn.
Gastridium australe, Beauv.
Koeleria cristata, Pers.
Catabrosa aquatica, Beauv.
Briza media, Linn.
— *minor*, Linn.
Agropyron junceum, Beauv.
Lepturus filiformis, Trin.
Hymenophyllum tunbridgense,
Sm.
— *unilaterale*, Bory.

6. FALMOUTH DISTRICT

The boundaries are : east, the Fowey District ; north, the North Coast District ; south, the English Channel from Pentewan to Port Navis on the Helford river ; west, the parish road branching from the Redruth-Helston road near Carnmenellis and running through Carn-
 kie to the Helston-Falmouth turnpike. After keeping to the turnpike as far as the Traveller's
 Inn the boundary follows a narrow lane leading to Eathorne, Trewoon, Bosvarren, and Port
 Navis.

The Devonian rocks which occupy so large a portion of the North Coast District pass
 right across this to the coast between Pentewan and Mevagissey, taking in parts of the parishes
 of Ladock, St. Allen, St. Erme, Kenwyn, Probus, Grampound, Tregony and St. Ewe. From
 Probus and Tregony Church-towns, with the exception of a small patch of Devonian between
 Mevagissey and Gorran, and a little serpentine at the Nare Head, the rocks of the Roseland
 District are Lower Silurian. On the western side of Falmouth Harbour these rocks sweep
 from Restronguet Creek to Port Navis and again appear farther inland in the Gwennap and
 Chacewater District. The Carnmenellis granite mass occupies the parishes of Wendron,
 Stithians, Mabe, Budock, and parts of Gwennap, St. Gluvias, Mawnan, and Constantine.
 Around it, from the western end of Gwennap to Penryn, a narrow band of Cambrian rocks
 occur, which at Ponsanooth strikes out through the southern end of Perran-ar-worthal and
 makes up the whole of the parish of Feock and a goodly portion of Kea.

The rivers of the district run in two opposite directions, emptying themselves in the
 several creeks of Falmouth Harbour. To the Fal belongs chief place. Rising on the Goss
 Moor, it takes an even course south by west, and after a flow of 19½ miles through a finely
 wooded and highly cultivated country pours its waters into the tidal creek at Ruanlanihorne.
 At a mile or so east of Grampound Road Station it is augmented by a stream which brings
 down the drainage from Hensbarrow Downs. Next in importance to the Fal is the Tre-
 sillian river, whose source is in the parish of St. Enoder. With its tributaries its principal
 drainage area is the parishes of Ladock, St. Erme, and Probus. The remaining streams all
 fall below 6 miles in length. The Allen rises at Ennis in St. Erme, and takes an almost due
 north to south direction. Almost on the border line of the North Coast District in the parish

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of Kenwyn rises a stream which takes its name from the parish. After a course of 4 miles it joins the Tresillian river at Truro. Calenick, Carnon, and Kennall streams, of about equal length and all running from west to east, receive the drainage of the country lying between Three Barrows and Carnmenellis and pour it into the creeks at Calenick, Carnon, and Perran-wharf respectively. Mining operations in the parishes of Gwennap and Kenwyn have so changed the conditions of the Carnon watershed as to make it a very poor district to botanists.

If a definition in the terms of half a dozen plants were invited for this portion of Cornwall, *Chrysanthemum segetum*, *Wahlenbergia hederacea*, *Erica ciliaris*, *Sibthorpia europæa*, *Linaria repens*, and *Bartsia viscosa* could be mentioned. In summer and autumn field after field is transformed into a blaze of yellow with the corn marigold, to the keen chagrin of the careful farmer. Pasture-land, crofts, and waysides alike bear the viscid yellow bartsia in great profusion, the plant being a much more abundant weed in this district than its congener. The ivy-leaved campanula lurks in almost every damp waterside meadow and shady hedge, often accompanied by the less obtrusive little Cornish moneywort. *Erica ciliaris* is more eclectic. Starting with the woods at Carclew, where it ranges over scores of acres, it stretches northward over the crofts between Perranwell and Truro, eventually joining the *ciliaris* tract of the North Coast District, the offspring between it and *Tetralix* everywhere keeping it company. While a stray patch or two of *Linaria repens* may be met in the parishes of Gwennap and St. Gluvias, it is at Mabe and Budock that it attains its maximum frequency. In the autumn mile after mile of the wayside hedges is adorned with its delicately pencilled flowers.

Rare sylvestral plants are not to be counted on in this district. Many of the woods bear *Listera ovata*, *Asperula odorata*, *Melittis Melissophyllum*, and *Narcissus Pseudo-narcissus*. *Neottia Nidus-avis* has persisted in a safe place in the woods at Enys for more than half a century, and *Convallaria majalis* is sparingly represented near Ponsanooth.

On the moors in the north-eastern corner of the district *Ranunculus tripartitus* and *Illecebrum verticillatum* have been found, but only in small quantity. In the south-western corner the latter plant is by no means uncommon, the present writer being acquainted with one place where there are acres of it. *Utricularia minor*, by no means frequent in Cornwall, can always be gathered in shallow pools in the parishes of Gwennap, St. Gluvias, Mabe, and Wendron. Practically every moor of note gives *Drosera rotundifolia*, *D. intermedia*, and *Pinguicula lusitanica*. Quite recently a poor specimen of *Hippuris vulgaris* was found in a small bog in the parish of Mabe, the only county record for nearly ninety years. Goss Moor is the only spot in Cornwall where *Nymphæa lutea* is certainly wild.

Fifty years ago *Draba muralis* was reported for an old wall near Carclew. In point of fact the record may have been correct, but there is much to be said for the hesitancy which botanists have shown for accepting it other than as an escape.

In no other part of the county, unless it be at Par, have so many casuals appeared as at Falmouth. Every year almost their number is increased and not a few have become definitely established. Aliens also run into a long list, but of these the major part are but plants of a season. *Rapistrum rugosum* has long been a fixture, and although of more recent appearance *Matricaria discoidea* has seized a much larger area and bids fair to become a great nuisance. From Falmouth *Phalaris aquatica* has spread to Ponsanooth and Perranwell.

St. Anthony-in-Roseland gives quarters to *Allium Ampeloprasum* var. *Babingtonii*, *Lemna gibba*, *Cyperus longus*, and *Festuca sylvatica*. *Ophrys apifera* was found there many years ago as well as near Falmouth, but there is no recent record for it at either place nor for any other part of the county. That the Cornish records for so comparatively common a plant as *Lemna gibba* should begin and end with this parish is enough to stimulate the watchfulness of every west-country botanist.

Swanpool will always repay a search. *Ranunculus Baudotii*, *Fumaria Boræi*, *Rumex limosus*, *Ruppia spiralis*, *R. rostellata*, *Briza maxima*, *Chara aspera*, *C. hispida*, *C. canescens*, *Nitella translucens* and *N. opaca* are all to be found there.

SPECIES AND VARIETIES WORTH NOTING IN THE FALMOUTH DISTRICT

Ranunculus peltatus, Schrank
— *arvensis*, Linn.
Helleborus viridis, Linn.
Papaver hybridum, Linn.
Glaucium phæniceum, Crantz
Neckeria lutea, Scop.
— *claviculata*, N. E. Br.

Fumaria muralis, Sonder.
— *purpurea*, Pug.
Nasturtium sylvestre, DC.
Alyssum maritimum, Linn.
Hesperis matronalis, Linn.
Sisymbrium altissimum, Linn.
Erysimum perfoliatum, Crantz

Camelina sativa, Crantz, var.
fætida (Fr.)
Diploxys tenuifolia, DC. [Syme
— *muralis*, DC., var. *Babingtonii*,
Coronopus didymus, Sm.
— *Ruellii*, All.
Lepidium ruderales, Linn.

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- Lepidium Draba*, Linn.
Thlaspi perfoliatum, Linn.
Teesdalia nudicaulis, R. Br.
Raphanus maritimus, Sm.
Reseda alba, Linn.
— *lutea*, Linn.
Viola hirta, Linn.
— *lactea*, Sm.
Dianthus Armeria, Linn.
Saponaria Vaccaria, Linn.
Cerastium quaternellum, Fenzl.
Stellaria palustris, Retz.
Sagina maritima, Don.
— *ciliata*, Fr.
— *subulata*, Presl.
— *nodosa*, Fenzl.
Polycarpon tetraphyllum, Linn.
Claytonia perfoliata, Don.
Hypericum bircinum, Linn.
— *elatum*, Ait.
— *calycinum*, Linn.
— *undulatum*, Schousb.
Malva rotundifolia, Linn.
Geranium striatum, Linn.
— *phæum*, Linn.
— *pratense*, Linn.
— *pyrenaicum*, Burm. fil.
— *rotundifolium*, Linn.
Erodium moschatum, L'Hérit.
— *maritimum*, L'Hérit.
Oxalis corniculata, Linn.
Trigonella purpurascens, Lam.
Medicago falcata, Linn.
— *denticulata*, Willd., var. *apiculata* (Willd.)
Melilotus alba, Desr.
— *arvensis*, Wallr.
Trifolium squamosum, Linn.
— *scabrum*, Linn.
— *fragiferum*, Linn.
— *resupinatum*, Linn.
Lotus angustissimus, Linn.
— *hispidus*, Desf.
Vicia lathyroides, Linn.
Lathyrus Aphaca, Linn.
— *Nissolia*, Linn.
— *latifolius*, Linn.
— *sylvestris*, Linn.
Alchemilla vulgaris, Linn.
Agrimonia odorata, Mill.
Pyrus rotundifolia, Bechst.
Saxifraga tridactylites, Linn.
Sedum Telephium, Linn.
— *album*, Linn.
— *rupestre*, Linn.
Epilobium roseum, Schreb.
Sium erectum, Huds.
Daucus gummifer, Lam.
Caucalis daucoides, Linn.
Asperula arvensis, Linn.
Valerianella carinata, Loisel.
— *rimosa*, Bast.
Scabiosa Columbaria, Linn.
Erigeron canadense, Linn.
— *acre*, Linn.
Filago minima, Fr.
Inula Conyza, DC.
Anthemis Cotula, Linn.
— *arvensis*, Linn.
Doronicum Pardalianches, Linn.
Mariana lactea, Hill.
Picris hieracioides, Linn.
Crepis taraxacifolia, Thuill.
Lysimachia Nummularia, Linn.
Anagallis cærulea, Schreb.
Centunculus minimus, Linn.
Microcala filiformis, Hoff. & Link.
Blackstonia perfoliata, Huds.
Symphytum tuberosum, Linn.
Lithospermum officinale, Linn.
Echium vulgare, Linn.
Lycium barbarum, Linn.
Datura Stramonium, Linn.
Verbascum Lychnitis, Linn.
Linaria purpurea, Linn.
Antirrhinum Orontium, Linn.
Scrophularia Scorodonia, Linn.
Orobanche major, Linn.
— *elatiior*, Sutton
— *minor*, Sm.
— *amethystea*, Thuill.
Littorella juncea, Berg. [Linn.
Chenopodium polyspermum,
— *murale*, Linn.
— *rubrum*, Linn., var. *pseudobotryoides*, H.C. Wats.
— *Bonus-Henricus*, Linn.
Polygonum Raii, Bab.
— *maritimum*, Linn.
— *mite*, Schrank.
Daphne Laureola, Linn.
Hippophae rhamnoides, Linn.
Euphorbia platyphyllos, Linn.
— *portlandica*, Linn.
Myrica Gale, Linn.
Carpinus Betulus, Linn.
Elodea canadensis, Michx.
Neottia Nidus-avis, Rich.
Orchis Morio, Linn.
— *incarnata*, Linn.
Habenaria conopsea, Benth.
Iris foetidissima, Linn.
Narcissus incomparabilis, Mill.
Allium triquetrum, Linn.
Ornithogalum umbellatum, Linn.
Juncus squarrosus, Linn.
— *glaucus*, Leers
— *maritimus*, Lam.
Luzula Forsteri, DC.
Sparganium simplex, Huds.
Arum italicum, Mill. [& Koch
Potamogeton obtusifolius, Mert.
Zannichellia palustris, Linn.
Zostera marina, Linn.
Eriophorum vaginatum, Linn.
— *latifolium*, Hoppe.
Rhynchospora alba, Vahl.
Carex dioica, Linn.
— *divisa*, Huds.
— *divulsa*, Good.
— *Boeninghausiana*, Weihe.
— *pendula*, Huds.
— *distans*, Linn.
— *fulva*, Good.
— *extensa*, Good.
— *acutiformis*, Ehrh.
— *riparia*, Curtis
— *rostrata*, Stokes
Setaria viridis, Beauv.
Milium effusum, Linn.
Agrostis setacea, Curtis
Apera Spica-venti, Beauv.
Gastridium australe, Beauv.
Fibichia umbellata, Koel.
Koeleria cristata, Pers.
Melica uniflora, Retz.
Briza media, Linn.
— *minor*, Linn.
Poa nemoralis, Linn.
Glyceria maritima, Mert. & Koch
Festuca procumbens, Kunth.
Bromus tectorum, Linn.
Lolium temulentum, Linn.
Agropyron junceum, Beauv.
Lepturus filiformis, Trin.
Hymenophyllum tunbridgensis, Sm.
Adiantum Capillus-Veneris, Linn.
Asplenium lanceolatum, Huds.
Ceterach officinarum, Willd.
Polypodium vulgare, Linn., var.
— *Cornubiense*, Moore
— *polypodioides*, Fée
Ophioglossum vulgatum, Linn.
Equisetum maximum, Lam.
Pilularia globulifera, Linn.

7. LIZARD DISTRICT

The western line of demarcation of the Falmouth District, a short portion of the North Coast boundary lying between Nine Maidens and Praze Station, the high road from Praze through Sithney to the five turnings half a mile or so beyond, thence to Porthleven, and the coast from Porthleven to Port Navis, give the outline of this district.

To the geologist the Lizard has furnished more material for contention than it has to the botanist. For while even in the earliest days of the science of plant geography botanists were able to offer shrewd observations on the why and the wherefore of the flora of the district, we are still a long remove from hearing the final word about the interesting group of rocks at and

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around the Lizard. In the north of the district, in the parish of Wendron and stretching away through Mabe and Constantine, we make our last acquaintance with the Carnmenellis Granite Boss. South of it a wide belt of Lower Silurian rocks extends right across the peninsula from Porthleven to Nare Point. From the Manacles through the parishes of St. Keverne, St. Martin, and Cury to Mullion, with but a slight break to the south of Mawgan, there is a belt of varying breadth of micaceous slates, generally classed as Archæan. They consist of gneissose rock, hornblende schist, gabbro, diabase, etc., and are said to be similar in character to those forming the southern extremity of Devonshire between Bolt Tail and the Start, and those on which the Eddystone lighthouse is built. The Lizard Head is made up of the same rocks. Between Nare Point and Manaccan village there is a slight remnant of Lower Devonian. The remainder of the peninsula is made up of serpentine and diallage, the diallage occurring principally in the parish of St. Keverne.

The Cober, rising on the moors near Carnmenellis, takes to the Loe Pool the greater part of the drainage of the parish of Wendron. Its length is about 10 miles. A number of streams, having their origin at different points on and around Goonhilly Downs and the parishes of Wendron and Mabe, drain the remainder of the district. The lower Cober Valley between Helston and the Loe Pool, and the several tidal valleys on the Helford river, possess scenery of rare quality. Not less interesting in their own way is the extensive view to be obtained from the summit of Carnmenellis, 818 feet above sea level, the wild grandeur of the breezy Goonhilly Downs when heath and furze have enlivened the scene with their flowers, and the rugged scenery of the precipitous coast.

A brief paragraph or two will be sufficient to show why for so many years this part of Cornwall has been the Mecca of British botanists. Mile for mile, it may be questioned whether any other part of the British Isles contains so many rare indigenous plants. Here only, for instance, have we Cornish records for the following species: *Thalictrum dunense*, *T. collinum*, *T. majus*, *T. flavum*, *Ranunculus heterophyllus*, *Silene conica*, *Arenaria verna* var. *Gerardi*, *Vicia sylvatica*, *Hypochaeris maculata*, *Erythræa* [capitata] var. *sphærocephala*, *Gentiana baltica*, *Orobanche Picridis*, *Rumex maritimus*, *Juniperus communis*, *Asparagus officinalis*, *Funcus pygmæus*, *Sparganium neglectum*, *Lemna trisulca*, *Carex axillaris*, *Avena pratensis*, *Chara polyacantha*, *C. baltica* var. *affinis*. As stated earlier in this paper, *Corrigiola littoralis* must now be reckoned among extinctions.

To the British flora the district contributes the following, i.e. plants not occurring in any other part of the British Isles: *Cytisus scoparius* var. *prostratus*, *Trifolium Molinerii*, *T. Bocconi*, *Herniaria ciliata*, *Nitella hyalina*.

Strong reasons can be furnished for excluding *Herniaria glabra* and *Salvia Verbenaca* var. *clandestina* from the flora of this district. Plants in the British Museum and in the late Professor Babington's herbarium labelled '*glabra*' certainly show nearer approach to *H. ciliata* than to that species. The late Mr. J. Cunnack, who was thoroughly acquainted with the botany of the Lizard, left a note which the writer has seen expressing doubt about the identity of the plant. With regard to the *Salvia*, Dr. Syme was among the first to challenge Cornish records. Without any qualification soever he says the specimens he had seen from Cornwall were all referable to *Verbenaca*. Recently, at the writer's request, Mr. C. E. Salmon of Reigate made a careful inspection of the specimens in Professor Babington's herbarium, and while of opinion that they must be accepted as forms of *Verbenaca*, he was perfectly satisfied that they were not emphatic enough for *clandestina*.

Whether it be the higher moorlands in Wendron, the extensive downs which make up such a large portion of the district, or the coast with its numerous valleys, they all contain a rich assemblage of plants. On the granite moors *Teesdalia nudicaulis*, *Filago minima*, *Utricularia minor*, *Pinguicula lusitanica*, and *Illecebrum verticillatum* are common. The downs give miles of *Erica vagans* and *Spiræa Filipendula*, and, among many other things, the following: *Ranunculus heterophyllus*, *Viola lactea*, *Genista anglica*, *G. pilosa*, *G. tinctoria* var. *humifusa*, *Poterium officinale*, *Microcala filiformis*, *Gentiana campestris*, *G. baltica*, *Littorella juncea*, *Juniperus communis*, *Allium sibiricum*, *Funcus pygmæus*, *F. capitatus*, and many of the *Potamogetons*, *Carices*, and *Charas* mentioned in the list of species. Along the coast and up the inlets the diligent observer will meet *Thalictrum dunense*, *T. collinum*, *T. majus*, *T. flavum*, *Viola Curtisii*, *Silene conica*, *S. noctiflora*, *Cerastium pumilum*, *Arenaria verna* var. *Gerardi*, *Geranium sanguineum*, *Cytisus scoparius* var. *prostratus*, *Trifolium Molinerii*, *T. Bocconi*, *T. strictum*, *Lotus angustissimus*, *L. hispidus*, *Vicia lutea*, *Filago apiculata*, *Inula Helenium*, *I. crithmoides*, *Hypochaeris maculata*, *Statice auriculæfolia*, *Erythræa* [capitata] var. *sphærocephala*, *Orobanche rubra*, *Herniaria ciliata*, *Ruscus aculeatus*, *Allium Schœnoprassum*, *A. sibiricum*, *Scilla autumnalis*, *Cyperus longus*.

BOTANY

The Loe Pool, the largest sheet of inland water in the county, has yielded a number of rare and local plants. To the keen regret of west-country botanists a recent raising of the water level has resulted in the disappearance of *Corrigiola littoralis*; but almost at the very time of that unfortunate occurrence a genuine solace was forthcoming in the discovery by the Rev. G. R. Bullock-Webster of *Nitella hyalina*, the first and still the only British record for a particularly graceful plant. *Castalia speciosa*, *Elatine hexandra*, *Pyrus torminalis*, *Bidens cernua*, *B. tripartita*, *Mimulus Langsdorffii*, *Sibthorpia europæa*, *Utricularia minor*, *Scutellaria galericulata*, *Melittis Melissophyllum*, *Chenopodium rubrum* var. *pseudo-botryoides*, *Euphorbia portlandica*, *Ruscus aculeatus*, *Juncus pygmaeus*, *Polygonum maritimum*, *Potamogeton perfoliatus*, *Ruppia spiralis*, *R. rostellata*, *Zannichellia palustris*, *Eleocharis acicularis*, R. Br., are but a few of the plants to be found on, in, or adjacent to the Pool.

SPECIES AND VARIETIES WORTH NOTING IN THE LIZARD DISTRICT

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| Ranunculus Baudotii, Godr. | Pimpinella major, Huds. | Euphorbia Paralias, Linn. |
| — tripartitus, DC. | Cenante fistulosa, Linn. | Orchis Morio, Linn. |
| — Lingua, Linn. | — pimpinelloides, Linn. | — incarnata, Linn. |
| Helleborus viridis, Linn. | — Lachenalii, C. Gmel. | Habenaria conopsea, Benth. |
| Papaver hybridum, Linn. | Sambucus Ebulus, Linn. | Iris foetidissima, Linn. |
| Fumaria pallidiflora, Jord. | Asperula odorata, Linn. | Allium Ampeloprasum, Linn., var. |
| Alyssum maritimum, Linn. | Valerianella carinata, Loisel. | Babingtonii (Borr.) |
| Erophila vulgaris, DC. | — rimosa, Bast. | — triquetrum, Linn. |
| Camelina sativa, Crantz | Anthemis Cotula, Linn. | Scilla verna, Huds. |
| Brassica oleracea, Linn. | — arvensis, Linn. | Typha latifolia, Linn. |
| Coronopus didymus, Sm. | — nobilis, Linn. | Sparganium simplex, Huds. |
| Lepidium Draba, Linn. | Senecio erucifolius, Linn. | Arum italicum, Mill. |
| Thlaspi arvense, Linn. | Mariana lactea, Hill | Alisma ranunculoides, Linn. |
| Iberis amara, Linn. | Crepis biennis, Linn. | Eleocharis acicularis, R. Br. |
| Raphanus maritimus, Sm. | Tragopogon pratense, Linn. | Scirpus Caricis, Retz. |
| Viola hirta, Linn. | — porrifolium, Linn. | Rhynchospora alba, Vahl. |
| Cerastium quaternellum, Fenzl. | Campanula rotundifolia, Linn. | Cladium jamaicense, Crantz |
| Sagina ciliata, Fr. | Centunculus minimus, Linn. | Carex dioica, Linn. |
| — subulata, Presl. | Symphytum tuberosum, Linn. | — divisa, Huds. |
| — nodosa, Fenzl. | Echium plantagineum, Linn. | — disticha, Huds. |
| Buda rupestris | Cuscuta Trifolii, Bab. | — divulsa, Good. |
| Polycarpon tetraphyllum, Linn. | Verbascum virgatum, Stokes | — Boeninghausiana, Weihe |
| Hypericum hircinum, Linn. | Linaria repens, Mill. | — curta, Good. |
| — elatum, Ait. | — viscida, Mærch. | — pallescens, Linn. |
| — undulatum, Schousb. | Orobancha major, Linn. | — rostrata, Stokes |
| Malva rotundifolia, Linn. | — minor, Sm. | Gastridium australe, Beauv. |
| Geranium sanguineum, Linn., | Mentha pubescens, Willd. | Koeleria cristata, Pers. |
| and var. prostratum (Cav.) | — hirsuta, Huds., var. citrata | Briza media, Linn. |
| — striatum, Linn. | (Ehrh.) | — minor, Linn. |
| — phæum, Linn. | — sativa, Linn., var. subglabra, | Poa Chaixii, Vill. |
| — lucidum, Linn. | Baker | Glyceria aquatica, Sm. |
| Erodium moschatum, L'Hérit. | — gentilis, Linn. | — distans, Wahlenb. |
| — maritimum, L'Hérit. | — Pulegium, Linn., and var. | Lolium temulentum, Linn. |
| Trigonella purpurascens, Lam. | erecta, Syme | Lepturus filiformis, Trin. |
| Medicago denticulata, Willd. | Thymus Chamædrys, Fr. | Asplenium lanceolatum, Huds. |
| Melilotus arvensis, Wallr. | Calamintha Clinopodium, Spenn. | Ophioglossum vulgatum, Linn. |
| Trifolium subterraneum, Linn. | Melissa officinalis, Linn. | Equisetum maximum, Lam. |
| — scabrum, Linn. | Nepeta Cataria, Linn. | Lycopodium Selago, Linn. |
| — fragiferum, Linn. | Leonurus Cardiaca, Linn. | — inundatum, Linn. |
| Potentilla palustris, Scop. | Lamium intermedium, Fr. | — clavatum, Linn. |
| Agrimonia odorata, Mill. | Chenopodium polyspermum, Linn. | Pilularia globulifera, Linn. |
| Poterium polygamum, Waldst. & Kit. | — murale, Linn. | Chara fragilis, Desv. |
| Sedum reflexum, Linn. | — urbicum, Linn. | — fragifera, Durieu |
| Myriophyllum spicatum, Linn. | — glaucum, Linn. | — aspera, Willd., and var. des- |
| — alterniflorum, DC. | — Bonus-Henricus, Linn. | macantha, H. & J. G. |
| Eryngium maritimum, Linn. | Polygonum Raii, Bab. | — hispida, Linn. |
| Apium graveolens, Linn. | — minus, Huds. | — vulgaris, Linn., var. longi- |
| — inundatum, Reichb. fil. | — mite, Schrank. | bracteata, Kuetz |
| Sison Amomum, Linn. | — maculatum, Trim. & Dyer | — canescens, Loisel. |
| Sium erectum, Huds. | Rumex rupestris, Le Gall. | Nitella flexilis, Agardh |
| | — limosus, Thuill. | — opaca, Agardh |

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8. LAND'S END DISTRICT

All that portion of the county lying to the west of the railway line from Hayle to Praze and of the high road from Praze through Sithney to Porthleven, including the Scilly Isles, is included in this district. Its coast line is therefore greater than that possessed by either of the districts already noticed.

Geologically it is of homogeneous character. The eastern boundary line runs across the Cambrian rocks which encircle the greater part of the Carnmenellis granite, and of which only a small area is included in this district. They stretch across the parishes of Breage and Germoe to the detached mass of granite forming Tregonning and Godolphin Hills. As far west as Newlyn, Madron, Ludgvan, and St. Ives, the rocks are Lower Silurian, much interrupted by lodes, cross-courses, and elvan dykes. Beyond this the country is entirely granite, belted along the coast from Cape Cornwall to St. Ives with a narrow fringe of greenstone. Greenstone is also found in the Lower Silurian rocks along Mount's Bay.

The scarcity of trees, the extensive chain of hills stretching from Lelant to Cape Cornwall and the Land's End, the wild crofts and moors dotted with the ruins of a decadent industry, and the stray vestiges in stone and tumuli left by a long vanished people, give a seductive wildness and grandeur to the landscape to the north and west of Penzance.

From causes difficult to explain more plants have disappeared from this district than from any other section of the county. The extinctions include *Ranunculus circinatus*, *Hypericum linarifolium*, *Althæa officinalis*, *Lathyrus maritimus*, *Drosera anglica*, *Hippuris vulgaris*, *Lythrum Hyssopifolia*, *Diotis candidissima*, *Linaria supina*, *Cladium jamaicense*.

On the other hand the district is being continually enriched by 'casuals' and 'aliens,' though in this respect there has been a marked falling off since the old days when winnowing was largely carried on on the Eastern Green, Penzance. Under this head must be classed *Fumaria densiflora*, *F. parviflora*, *Medicago sylvestris*, *M. denticulata*, *Melilotus indica*, *Sedum sexangulare*, *Asperula arvensis*, *Centaurea Calcitrapa*, *C. solstitialis*, *Stachys annua*, *Plantago arenaria*, *Mercurialis annua*, *Polypogon monspeliensis*, *Apera Spica-venti*, *Lagurus ovatus* (Scilly Isles), *Poa alpina*, *Bromus madritensis*, *B. arvensis*. *Pinguicula grandiflora* was accidentally introduced from Ireland many years ago by Dr. Ralfs, and is now very plentiful in a marsh or two to the west of Penzance. In a ravine near Zennor *Mimulus Langsdorffii* has established itself almost to the exclusion of other riparian plants.

Reseda alba, *Lavatera sylvestris*, *Oxalis stricta*, *Echium plantagineum*, and *Iris tuberosa* were admitted into the British Flora on the strength of their naturalization in this district; and *Daucus gummifer* was elevated from varietal to specific rank from a consideration of specimens gathered near Zennor.

Outside this district Cornwall does not possess the following: *Viola tricolor* var. *nana*, *Lavatera sylvestris*, *Oxalis stricta*, *Ulex nanus*, *Medicago minima*, *Trifolium repens* var. *Townsendii*, *Ornithopus ebracteatus*, *Filago spathulata*, *Limosella aquatica*, *Mentha rubra*, *Iris tuberosa*, *Eleocharis uniglumis*, *Carex arenaria* var. *ligerica*, *Cryptogramme crispa*, *Ophioglossum vulgatum* var. *polyphyllum*.

Erica vagans has been reported from Zennor and *Orobanche purpurea* from Penzance, but Dr. Ralfs never countenanced the records.

SPECIES AND VARIETIES WORTH NOTING IN THE LAND'S END DISTRICT

| | | |
|---|---|--|
| <i>Ranunculus peltatus</i> , Fries | <i>Erophila vulgaris</i> , DC. | <i>Sagina maritima</i> , Don., var. <i>debilis</i> (Ford.) |
| — <i>Baudotii</i> , Godr., var. <i>confusus</i> (Godr.) | <i>Cochlearia anglica</i> , Linn. | — <i>subulata</i> , Presl. |
| — <i>sardous</i> , Crantz, var. <i>parvulus</i> (Linn.) | <i>Erysimum perfoliatum</i> , Crantz | — <i>nodosa</i> , Fenzl. |
| — <i>arvensis</i> , Linn. | <i>Camelina sativa</i> , Crantz, var. <i>fætida</i> (Fr.) | <i>Polycarpon tetraphyllum</i> , Linn. |
| <i>Helleborus viridis</i> , Linn. | <i>Brassica oleracea</i> , Linn. | <i>Elatine hexandra</i> , DC. |
| <i>Castalia speciosa</i> , Salisb. | <i>Diplotaxis muralis</i> , DC. | <i>Hypericum dubium</i> , Leers |
| <i>Papaver somniferum</i> , Linn. | <i>Lepidium ruderales</i> , Linn. | — <i>undulatum</i> , Schousb. |
| — <i>Argemone</i> , Linn. | <i>Thlaspi arvense</i> , Linn. | — <i>montanum</i> , Linn. |
| — <i>hybridum</i> , Linn. | <i>Reseda lutea</i> , Linn. | <i>Malva pusilla</i> , Sm. |
| <i>Glauicum flavum</i> , Crantz | <i>Viola lactea</i> , Sm. | <i>Geranium striatum</i> , Linn. |
| <i>Fumaria pallidiflora</i> , Ford. | — <i>Curtisii</i> , Forster | — <i>pusillum</i> , Linn. |
| — <i>Boræi</i> , Ford. | <i>Polygala calcarea</i> , F. Schultz. | — <i>rotundifolium</i> , Linn. |
| — <i>muralis</i> , Sonder. | <i>Dianthus Armeria</i> , Linn. | <i>Genista pilosa</i> , Linn. |
| <i>Arabis hirsuta</i> , Scop. | <i>Saponaria Vaccaria</i> , Linn. | <i>Ononis spinosa</i> , Linn. |
| <i>Alyssum maritimum</i> , Linn. | <i>Cerastium quaternellum</i> , Fenzl. | <i>Trigonella purpurascens</i> , Lam. |
| | — <i>pumilum</i> , Curtis | <i>Medicago falcata</i> , Linn. |

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- Medicago denticulata*, Willd., var. *apiculata* (Willd.)
Melilotus arvensis, Wallr.
Trifolium glomeratum, Linn.
— *suffocatum*, Linn.
— *fragiferum*, Linn.
Lotus angustissimus, Linn.
— *hispidus*, Desf.
Rubus suberectus, Anders.
— *Lindleianus*, Lees
— *ramnifolius*, W. & N.
— *ramosus*, Briggs
— *rusticanus*, Merc.
— *mucronatus*, Blox.
— *Leyanus*, Rogers
— *foliosus*, W. & N.
— *hirtus*, W. & K.
— *Balfourianus*, Sibth.
Potentilla procumbens, Sibth.
Agrimonia odorata, Mill.
Sedum Telephium, Linn.
Apium inundatum, Reichb. fl.
Oenanthe fistulosa, Linn.
— *pimpinelloides*, Linn.
Caucalis daucoides, Linn.
Sambucus Ebulus, Linn.
Galium Vaillantii, DC.
Asperula odorata, Linn.
Valerianella eriocarpa, Desv.
— *carinata*, Loisel
— *rimosa*, Bast.
— *dentata*, Poll.
Inula Helenium, Linn.
— *crithmoides*, Linn.
Carduus crispus, Linn.
Statice auriculæfolia, Vahl.
Primula veris, Linn.
Anagallis cærulea, Schreb.
Centunculus minimus, Linn.
Microcala filiformis, Hoffm. & Link.
Gentiana Amarella, Linn.
Gentiana campestris, Linn.
Anchusa officinalis, Linn.
Lithospermum arvense, Linn.
Echium plantagineum, Linn.
Solanum nigrum, Linn., var. *miniatum* (Bernh.)
Lycium barbarum, Linn.
Verbascum virgatum, Stokes
— *Blattaria*, Linn.
Scrophularia Scorodonia, Linn.
Rhinanthus major, Ehrh.
Orobanche major, Linn.
— *elator*, Sutton
— *Hederæ*, Duby
— *minor*, Sm.
— *amethystea*, Thuill.
Utricularia vulgaris, Linn.
— *neglecta*, Lehm.
— *minor*, Linn.
Pinguicula lusitanica, Linn.
Mentha pubescens, Willd.
— *hirsuta*, Huds., var. *citrate* (Ehrh.)
— *gentilis*, Linn.
Thymus Chamædryas, Fr.
Melissa officinalis, Linn.
Nepeta Cataria, Linn.
Scutellaria galericulata, Linn.
Marrubium vulgare, Linn.
Galeopsis Ladanum, Linn.
Lamium intermedium, Fr.
Littorella juncea, Berg.
Illecebrum verticillatum, Linn.
Chenopodium Vulvaria, Linn.
— *murale*, Linn.
— *urbicum*, Linn.
— *rubrum*, Linn.
— *Bonus-Henricus*, Linn.
Polygonum Raii, Bab.
— *maculatum*, Trim. & Dyer
Rumex rupestris, Le Gall
Hippophae rhamnoides, Linn.
Euphorbia Paralias, Linn.
— *portlandica*, Linn.
Elodea canadensis, Michx.
Epipactis palustris, Crantz
Orchis pyramidalis, Linn.
— *Morio*, Linn.
— *incarnata*, Linn.
Ruscus aculeatus, Linn.
Allium triquetrum, Linn.
Scilla autumnalis, Linn.
— *verna*, Huds.
Ornithogalum umbellatum, Linn.
Juncus capitatus, Weigel
Typha latifolia, Linn.
Arum italicum, Mill.
Potamogeton perfoliatus, Linn.
Ruppia rostellata, Koch.
Cyperus longus, Linn.
Scirpus pauciflorus, Lightf.
Eriophorum vaginatum, Linn.
Setaria viridis, Beauv.
Gastridium australe, Beauv.
Apera Spica-venti, Beauv.
Fibichia umbellata, Koel.
Sesleria cærulea, Ard.
Briza media, Linn.
— *minor*, Linn.
Poa compressa, Linn.
Glyceria distans, Wahlenb.
Festuca uniglumis, Soland.
Hymenophyllum tunbridgense, Sm.
— *unilaterale*, Bory.
Adiantum Capillus-Veneris, Linn.
Phegopteris polypodioides, Fée
Pilularia globulifera, Linn.
Chara fragilis, Desv., var. *capillacea*, Coss. & G.
— *fragifera*, Durieu
Nitella translucens, Agardh
— *flexilis*, Agardh

RUBI

Cornwall cannot yet be reckoned among those British counties whose brambles are mostly known. Indeed but for the late Mr. T. R. Archer Briggs' exhaustive examination of the forms of this genus which occur within twelve miles of Plymouth, this county would have had to be classed with those the brambles of which have in great part still to be ascertained.

So diligently however did Mr. Briggs explore the eastern end of the county before the production of his *Flora of Plymouth* that that work alone (published in 1880) contains the names of 31 species of *Rubus* found by him in greater or less abundance within his area on the Cornish side. Several of these happen to be of exceptional interest to the bramble student, e.g. *Rubus erythrinus*, Genev., referred to in *Fl. Plym.* p. 112, as 'allied to *Lindleianus*,' but afterwards in the *Journal of Botany* for 1890, p. 102, correctly named by Dr. Focke, and in pp. 204-6 of the same volume fully described by Mr. Briggs; *R. dumnoni-*

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ensis, Bab. (*R. incurvatus*, Bab., *Fl. Plym.* p. 113), described as a new species by Professor Babington in *Journ. Bot.* 1890, pp. 338, 339.

These were both unknown for the British Isles until discovered in the neighbourhood of Plymouth, although now ascertained to be rather widely distributed in Great Britain and Ireland. *R. dumnoniensis*, still undetected on the continent of Europe, has also been found at the Lizard and in the Channel Islands.

Among the other rare brambles discovered by Mr. Briggs within twelve miles of Plymouth on the Cornish side may be specially mentioned *R. affinis* var. *Briggsianus*, Rogers (*R. affinis*, *Fl. Plym.*); *R. leucandrus*, Focke (*R. birtifolius*, *Fl. Plym.*); *R. ramosus*, Briggs (*Journ. Bot.* 1871, pp. 330-2); *R. silvaticus*, Wh. & N. (*Journ. Bot.* 1890, pp. 274-6); *R. oigocladus*, Muell. & Lefv. (*R. fusco-ater*, *Fl. Plym.*). About six additional forms have been observed in other parts of east Cornwall, raising the number now known for that division of the county to 36 or 37.

The brambles of west Cornwall are much more imperfectly known. About 28 forms in all have been recorded for this division, but most of them are reported from one or two localities only. Of these 5 are at present unknown in east Cornwall. So the county as a whole may now be credited with a total of about 42 forms, a number which will probably be increased considerably by further research.

In the west thus far the Penzance neighbourhood seems to have been most closely worked. Thus of the 5 Cornish forms at present peculiar to this division 4 come from that neighbourhood, viz. *R. nemoralis*, P. J. Muell.; *R. clivicola*, A. Ley; *R. amplificatus*, Lees, and *R. adornatus*, P. J. Muell.; while the fifth, *R. dasyphyllus*, Rogers (*R. pallidus*, Bab., not of Wh. & N.), has been recorded from woods at Falmouth and Mawnan. This last form, which is far the most abundant glandular bramble in the north, is very thinly scattered in the south of England.

MENTHÆ

Two only of the species enumerated in the *London Catalogue* are wanting from Cornwall, viz. *M. gracilis* and *pratensis*. In the following table of distribution the numerals correspond with the divisions of the county.

| | | | |
|--------------------------------|---------------|-----------------------------------|----------|
| Mentha rotundifolia, Huds. | 1-8 | <i>b. subglabra</i> (Baker). | 3, 5, 6 |
| — alopecuroides, Hull. | 3, 5 | <i>c. citrata</i> (Ehrh.). | 7, 8 |
| — longifolia, Huds. | 1-3, 5-8 | Mentha sativa, Linn. | 1-8 |
| <i>b. nemorosa</i> . | 4, 5 | <i>b. paludosa</i> (Sole). | 1-3, 6-8 |
| <i>c. mollissima</i> (Borkh.). | 2-4 | <i>c. subglabra</i> , Baker. | 2, 4-7 |
| — <i>viridis</i> , Linn. | 2, 3, 5-8 | — <i>rubra</i> , Sm. | 8 |
| <i>b. crispa</i> , Hook. | 5, 6 | — <i>gentilis</i> , Linn. | 2-4, 6-8 |
| — <i>piperita</i> , Linn. | | <i>c. Pauliana</i> (F. Schultz.). | 5, 6 |
| <i>a. officinalis</i> (Hull). | 1-8 | — <i>arvensis</i> , Linn. | 1-8 |
| <i>b. vulgaris</i> (Sole). | 1, 3, 5, 7, 8 | <i>b. Nummularia</i> (Schreb.). | 3 |
| — <i>pubescens</i> , Willd. | | <i>c. agrestis</i> (Sole). | 1, 4 |
| <i>a. palustris</i> (Sole). | 5, 7, 8 | — <i>Pulegium</i> , Linn. | 2-8 |
| <i>b. hircina</i> (Hull). | 5 | <i>b. erecta</i> , Syme. | 3, 5-8 |
| — <i>hirsuta</i> , Huds. | 1-8 | | |

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FILICES, EQUISETACEÆ, LYCOPODIACEÆ, MARSILEACEÆ

The ferns of Cornwall run into a goodly number. A few of them are very local and scarce, and one or two have only a single station against them. The controversy about *Trichomanes radicans* at Tintagel has long been silenced, most botanists being satisfied of the *bona fides* of the record; but whether it was a native or a naturalized subject must always remain a matter of conjecture, as the plant was soon lost to the locality.

Adiantum Capillus-Veneris cannot much longer hold out against the phytological plunderer. One by one its old stations have had to be expunged from county lists until the 'irreducible minimum' is nearly reached. In the subjoined table where it has been known to occur rather than where it may now be found is indicated.

Equisetum sylvaticum was found on Cornish soil for the first time nearly twenty years ago. It is restricted to a small area in the parish of Week St. Mary. The other four species of *Equisetum* are generally distributed over the county.

FILICES

- Hymenophyllum tunbridgense, Sm. 1, 3-8
- unilaterale, Bory. 1, 2, 4, 5
- [Trichomanes radicans, Sw.] 1
- Adiantum Capillus-Veneris, Linn. 1, 4-6, 8
- Pteris aquilina, Linn. 1-8
- Cryptogramme crispa, R. Br. 8
- Lomaria spicant, Desv. 1-8
- Asplenium lanceolatum, Huds. 1-8
- c. microdon*, Moore. 8
- Adiantum-nigrum, Linn. 1-8
- b. obtusum*, Kit. & Milde. 5, 6
- d. acutum*, Poll. 6
- marinum, Linn. 1-8
- Trichomanes, Linn. 1-8
- Ruta-muraria, Linn. 1-8
- Athyrium Filix-femina, Roth. 1-8
- Ceterach officinarum, Willd. 1-8
- Scolopendrium vulgare, Adans. 1-8
- Polystichum lobatum, Presl. 4, 8
- b. aculeatum*, Syme. 2, 4-8
- angulare, Presl. 1-8
- Lastræa Oreopteris, Presl. 1-4, 6-8
- Filix-mas, Presl. 1-8
- c. palacea*, Moore. 1, 2, 4
- spinulosa, Presl. 1-4, 6-8
- d. glandulosa* (Moore, ex p.). 1
- dilatata, Presl. 1-8

Lastræa dilatata, Presl.

- b. tanacetifolia*, Moore. 3, 6
- æmula, Brackenbridge. 1-8
- Polypodium vulgare, Linn. 1-8
- b. serratum*, Willd.
- c. Cornubiense*, Moore. 6
- Phegopteris Dryopteris, Fée. 1, 4, 6
- polypodioides, Fée. 4, 6, 8
- Osmunda regalis, Linn. 1-8
- Ophioglossum vulgatum, Linn. 1, 2, 4-8
- b. polyphyllum*, Braun. 8
- Botrychium Lunaria, Sw. 1, 2, 4, 8

EQUISETACEÆ

- Equisetum maximum, Lam. 1, 6-8
- arvense, Linn. 1-8
- sylvaticum, Linn. 1
- palustre, Linn. 1-8
- b. polystachyum*, auct. 5, 6
- c. nudum*, Newm. 1, 3, 6, 8
- limosum, Sm. 1-6, 8
- b. fluviatile* (Linn.). 2, 4-6

LYCOPODIACEÆ

- Lycopodium Selago, Linn. 3, 4, 7
- inundatum, Linn. 3, 6-8
- clavatum, Linn. 1-3, 6, 7

MARSILEACEÆ

- Pilularia globulifera, Linn. 4, 6-8

CHARACEÆ

Before the final word can be written about the *Characeæ* of Cornwall, a great deal of systematic field work must be done. Strictly speaking, less than one-third of the county has been thoroughly searched. From the Tamar to Redruth there is an unbroken stretch of practically virgin ground for this particular class of plants, and the well-known fact that the unexpected always attends the movements of the Chara hunter, and that as recently as 1898 in *Nitella hyalina* Cornwall gave Great

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Britain a brand new species, should suffice to arouse the interest of a few resident botanists. From the eastern boundary of the county to Falmouth there are only five records for so common a species as *Chara fragilis*, and from Bridgerule to Hayle, a good two-thirds of the county, *C. vulgaris*, with three of its varieties, has only eight recorded stations. The appended table shows that not a single *Chara* has been reported from the Fowey division, and that only one species is known to occur in the Lower Tamar area. No one can accept this as a correct index of the *Chara* flora of those parts.

As a British plant *C. fragifera*, Durieu, is quite unknown outside the Lizard and Land's End divisions. Around Helston, on the Lizard Downs, near Marazion, on Chy-an-hal and Hale Ager Moors, west of Penzance, and on Tresco, one of the Scilly Islands, it can always be relied on if the summer is not an abnormally dry one.

C. polyacantha, Braun, and *C. baltica* var. *affinis*, H. & J. Groves, are confined to a restricted area west of the Lizard Head.

C. bispida, Linn., although generally distributed in other parts of the country, has only been found at Swanpool near Falmouth and at Kynance near the Lizard.

Nitella hyalina, Agardh, as already stated, is one of the rarest of British plants, a few square yards in the Loe Pool representing the area of its known occurrence in the British Isles.

N. gracilis, Agardh, was reported for the Goonhilly Down in the *Phytologist*, 1845, but in the absence of voucher specimens and recent confirmation the statement must be accepted with caution. Those were days when the *Characeæ* of this country were but little understood, and it is almost certain some other species, probably *N. opaca*, was mistaken for *N. gracilis*.

Chara fragilis, Desv. 1, 4, 6-8
 var. *barbata*, Gant. 8
 var. *capillacea*, Coss. & G. 8
 — *fragifera*, Durieu. 7, 8
 — *aspera*, Willd. 6, 7
 var. *desmacantha*, H. & J. G. 7
 — *polyacantha*, Braun. 7
 — *baltica* var. *affinis*, H. & J. G. 7
 — *bispida*, Linn. 6, 7
 — *vulgaris*, Linn. 1, 5, 7, 8

Chara vulgaris, Linn.
 var. *longibracteata*, Kuetz. 5, 7
 var. *atrovirens* (Lowe). 8
 var. *melanopyrena*, H. & J. G. 1
 — *canescens*, Loisel. 6, 7
Nitella gracilis, Agardh. 7 (?)
 — *translucens*, Agardh. 4-6, 8
 — *flexilis*, Agardh. 1, 4-8
 — *opaca*, Agardh. 1, 2, 6, 7
 — *hyalina*, Agardh. 7

MOSSES (*Musci*)

Cornwall is exceptionally favoured by its physical conditions for the growth of mosses. The moist air, warmed by the Gulf Stream, conduces to the growth of many southern species that find here conditions similar to those which obtain in the south-west of Ireland; and a few south European species have in Cornwall their northern limit. On the highlands of the Bodmin Moors a number of subalpine species grow, and on the calcareous sand of Hayle and St. Minver, and the serpentine formation of the Lizard, others grow which are absent from

BOTANY

the granite and clay slate. A comparatively small portion of the county has been explored for mosses, but the neighbourhood of Bodmin, in the eastern half, has been thoroughly examined by Mr. R. V. Tellam, who published a list of species in the *Transactions of the Penzance Natural History Society*, new ser. ii. 354 (1887-8), and the neighbourhood of Mount Edgcumbe, Saltash, and Torpoint, on the Cornish side of the Tamar, by Messrs. F. Brent and E. M. Holmes, whose records are given in vol. iii. of the *Annual Reports and Transactions of the Plymouth Institution and Devon and Cornwall Natural History Society*. The country around Penzance was carefully searched for many years by Mr. W. Curnow and Dr. Ralfs, and latterly by Mr. E. D. Marquand. A list of the species found by these botanists was given in the *Transactions of the Penzance Natural History and Antiquarian Society*, new ser. i. 117, 422, including a few others found by Messrs. E. M. Holmes, W. Mitten and W. B. Waterfall. Still later a few have been added by Mr. H. N. Dixon.

Dixon and Jameson's *Handbook of British Mosses* has been followed throughout in the lists here given, with the exception of the *Sphagnaceæ*, for which Horrell, *The European Sphagnaceæ* (after Warnstorf) has been utilized. The rarer species met with in the county are indicated by an asterisk preceding the name, and the very common species, 93 in number exclusive of varieties that occur in most counties, are not given in this list. The mosses characteristic of high moorland or subalpine districts are naturally fewer in number than in Devonshire, where the great extent of Dartmoor offers better conditions for their growth than the limited and somewhat warmer Bodmin Moors, which form its counterpart in Cornwall.

Of the rarer species *Campylopus introflexus* is usually found on granite near the sea; *Tortula canescens* on sunny, rocky declivities; *Philonotis rigida* in deep sheltered spots or glens. *Hookeria læte-virens* has been found nowhere else in Great Britain, and very sparingly in Ireland. *Eurhynchium strigosum* for many years was known to occur only near Truro in this country, and the locality has not been refound. *Ditrichum subulatum* occurs very sparingly near Truro and Saltash, and in a few spots in Devonshire on the opposite side of the Tamar, where it reaches apparently its northern limit. *Fissidens serrulatus* is a very rare European species and has not been found north of Cornwall, where only the male plant has been detected as yet. *F. polyphyllus* is also very rare, but has been found in Devon, north Wales, and Ireland. *Epipterygium Tozeri* seems to occur more abundantly on a yellowish clay-slate, which also *Tortula cuneifolia*, *Schistostega osmundacea* and *Ditrichum subulatum* seem to prefer, but it is rarely found in fruit.

Species preceded by a note of interrogation, although recorded by other botanists, have not been seen by the writer, who cannot guarantee their correctness. The rarest species are marked by an asterisk.

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SPHAGNACEÆ

- Sphagnum balticum*, Russ. *Penzance*
 — *cuspidatum*, Russ & Warnst. *Rough Tor*
 var. *plumosum*, Nees. *Trungle Moor*
 var. *falcatum*, Russ. *Penzance*
 — *cymbifolium*, Warnst. *Rough Tor*
 var. *fusco-flavescens*, Russ. *Penzance*
 — *fimbriatum*, Wils. *Helmentor Moor*,
 Penzance
 — *fuscum*, Klinggr. *Penzance*
 — **Girgensohnii*, Russ. *Cardinham*, *Penzance*
 — **Gravetii*, Russ. *Helmentor*
 — *inundatum*, Warnst. *Withiel*
 — *molluscum*, Bruch. *Halgaver Moor*,
 Bodmin
 — *obesum*, Schp. *Rough Tor*
 — *papillosum*, Ldb. *Halgaver Moor*,
 Bodmin
 var. *normale*, Warnst. *Penzance*
 f. *conferta*, Warnst. "
 — *quinquefarium*, Warnst. *Helmentor*
 Moor, *Penzance*
 — *rubellum*, Wils. *Halgaver Moor*, *Bodmin*
 var. *flavum*, Klinggr. *Penzance*
 — *rufescens*, Warnst. *Carn Galva Moor*
 — *subnitens*, Russ. & Warnst. *Cardinham*,
 W.C.
 var. *flavescens*, Warnst. *Penzance*; *St.*
 Mary's, *Scilly*
 — *subsecundum*, Nees. *Helmentor*

ANDREACEÆ

- Andreæa petrophila*, Ehrh. *Rough Tor*
 — *Rothii*, W. & M. *Gunwin Moor*
 var. *hamata*, Lindb. *Helmentor*
 var. *falcata*, Lindb. *Madron*

TETRAPHIDACEÆ

- Tetraphis pellucida*, Hedw. *Lanivet*, *Cardinham*, *Penzance*

POLYTRICHACEÆ

- Polytrichum aloides*, Hedw.
 var. *Dicksoni*, Wallm. *Roche*
 — **alpinum*, L. *Roche*, *Bodmin*, *Chyandour*
 — *commune*, L.
 var. *perigoniale*, B. & S. *Halgaver Moor*, *Bodmin*
 var. *minus*, Weis. *Roche*
 — *formosum*, Hedw. *Bodmin*, *Trevayler*
 — *gracile*, Dicks. *Chyandour*
 — *nanum*, Neck.
 var. *longisetum*, Lindb. *Bodmin*, *Trevayler*
 — *urnigerum*, L. *Roche*, *Bodmin*, *Chyandour*

BUXBAUMIACEÆ

- Diphyscium foliosum*, Mohr. *Cardinham*,
 Helmentor, *Chyandour*

DICRANACEÆ

- Archidium *alternifolium*, Schimp. *Hustyn Down*, *Penzance*
Pleuridium axillare, Lindb. *Bodmin*, *Roche*,
 Penzance
Ditrichum flexicaule, Hpe. *St. Minver*,
 Sennen
 — *homomallum*, Hpe. *Bodmin*, *Newlyn*
 — **subulatum*, Hpe. *Saltash*, *Truro*
Rhabdoweissia fugax, B. & S. *St. Breock*,
 Boscastle
Cynodontium Bruntoni, B. & S. *Helmentor*
Dichonodontium flavescens, Lindb. *Camel River*
 — *pellucidum*, Schp. *Camel River*
Dicranella cerviculata, Schp. *Bodmin*,
 Helmentor
 — **crispa*, Hedw. *Penzance*
 — *heteromalla*, Schp. *Bodmin*
 var. *stricta*, Schp. "
 var. *interrupta*, B. & S. *St. Breward*
 — *rufescens*, Schp. *Withiel*
 — **squarrosa*, Schrad. *Penzance*
Dicranoweissia cirrhata, Lindb. *Roche Rock*
Campylopus atrovirens, De Not. *Bodmin*
 — *brevipilus*, B. & S. *Penzance*
 — *flexuosus*, Brid. *Helmentor*, *Penzance*
 var. *uliginosus*, Ren. *Boswarva Moor*,
 Madron
 — *fragilis*, B. & S. *Bodmin*, *Penzance*
 — **introflexus*, Brid. *Penzance*
Dicranum Bonjeani, De Not. *Halgaver Moor*, *Penzance*
 var. *juniperifolium*, Braithw. *Roscorla*,
 St. Austell
 — *majus*, Turn. *Bodmin*, *Carn Galva*
 — **Scottianum*, Turn. *Rough Tor*, *Carn Galva*

FISSIDENTACEÆ

- Fissidens adiantoides*, Hedw. *Bodmin*,
 Tremethick Moor
 — *crassipes*, Wils. *Halgaver Moor*, *Bodmin*
 — *decipiens*, De Not. *Withiel*, *Trevayler*
 — **exilis*, Hedw. *Eglosbayle*
 — *osmundoides*, Hedw. *Boscastle*, *Withiel*
 — **polyphyllus*, Wils. *Dozmare Pool*,
 Penzance
 — **serrulatus*, Brid. *Penzance*
 — **tamarindifolius*, Wils. *Truro*
 — *viridulus*, Wahl. *Padstow*, *Bodmin*,
 Penzance
 var. *Lylei*, Wils. *Withiel*, *Trungle Moor*, *Penzance*

GRIMMIACEÆ

- Grimmia apocarpa*, Hedw.
 var. *rivularis*, W. & M. } *St. Minver*,
 var. *gracilis*, W. & M. } *Bodmin*

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GRIMMIACEÆ (continued)

- Grimmia decipiens*, Lindb. *Endellion*
 — **leucophæa*, Grev. *Newquay, Tintagel, Whitsand Bay*
 — *maritima*, Turn. *Seaton, Tintagel, St. Minver, Trefusis, Penzance*
 — **Muhlenbeckii*, Schp. *Kynance*
 — **patens*, B. & S. *Bodmin Moors, Brown Willy, Penzance*
 — **subsquarrosa*, Wils. *Carn Galva*
 — *trichophylla*, Grev. *St. Cleer, Witbiel, St. Minver, Ruthern, Penzance*
Racomitrium aciculare, Brid.
 var. *denticulatum*, B. & S. *Camel River, Bodmin*
 — **fasciculare*, Brid. *Witbiel, Helmentor, Penzance, Mill Bottom*
 — *heterostichum*, Brid.
 var. *alopecurum*, Hub. *Rough Tor*
 var. *gracilescens*, B. & S. *Helmentor*
 — **protensum*, Braun. "
 — *sudeticum*, B. & S. *Cheesewring, St. Cleer*
Ptychomitrium polyphyllum, Furnr. *Witbiel near Bodmin*
Hedwigia ciliata, Ehrh. *Helmentor, Penzance*

TORTULACEÆ

- Acaulon muticum*, C. M. *Roscorla, St. Austell*
Phascum curvicolle, Ehrh. *Gossmoor*
Pottia asperula, Mitt. *Witbiel, Falmouth*
 — *crinita*, Wils. *Endellion, Penzance*
 — *Heimii*, Furnr. *Looe, Marazion*
 — *Starkeana*, C.M. *Slades Bridge, Eglosbayle*
 — **viridifolia*, Mitt. *St. John's, Bodmin*
 — **Wilsoni*, B. & S. *Looe, St. Minver*
Tortula ambigua, Ångstr. *Wadebridge, Penzance*
 — *atrovirens*, Lindb. *Seaton, Truro*
 — **canescens*, Mont. *Penlee Point (the only Cornish locality known)*
 — *cuneifolia*, Roth. *Wadebridge, Truro*
 — *intermedia*, Berk. *St. Minver, Lelant*
 — *papillosa*, Wils. *St. John's*
 — *ruraliformis*, Dixon. *Hayle Sands, Penzance*
Barbula cylindrica, Schp. *Bodmin, St. Minver, Penzance*
 var. *vinealis*, Braithw. *Saltash*
 — *Hornschuchiana*, Schultz. *Penzance*
 — **recurvifolia*, Schp. *Hayle*
 — *sinuosa*, Braithw. *Bodmin, Sancreed*
 — *tophacea*, Mitt. *St. Minver, Penzance*
Leptodontium flexifolium, Hpe. *Penzance*
Weissia mucronata, B. & S. *Witbiel*
 — *tortilis*, C. M. *Marazion*
 — *verticillata*, Brid. *St. Minver, Penzance*

TORTULACEÆ (continued)

- Trichostomum crispulum*, Bruch. *Penzance*
 — *flavovirens*, Bruch. *Saltash, Gerrans*
 — **inclinatum*, Dixon. *St. Minver, Gerrans, Newlyn Cliff*
 — *mutabile*, Bruch. *Looe, St. Minver*
 var. *littorale*, Dixon. *St. Minver, Hayle (in fruit)*
Pleurochæte squarrosa, Lindb. *St. Minver, Hayle*
Cinclidotus fontinaloides, P. B. *Penzance*
 ENCALYPTACEÆ
Encalypta streptocarpa, Hedw. *St. Minver*

ORTHOTRICHACEÆ

- Zygodon conoideus*, H. & T. *Witbiel*
 — *Mougeotii*, B. & S. *Colquite Wood, St. Mabyn*
Uloa Bruchii, Hornsch. *Dunmeer Wood, Bodmin*
 — *crispa*, Brid. *Witbiel*
 var. *intermedia*, Dixon. *St. Tudy*
 var. *crispula*, Hamm. *Bodmin*
 — *Hutchinsiae*, Hamm. *Bodmin Moors, Brown Willy*
 — *phyllantha*, Brid. *Witbiel, Newlyn*
Orthotrichum Lyellii, H. & T. *Dunmeer Valley, Bodmin*
 — **pallens*, Bruch. *Minney, Madron*
 — *pulchellum*, Sm. *Witbiel*
 var. *Winteri*, Braithw. *Penzance*
 — *rivulare*, Turn. *Bodmin, Lizard*
 — *stramineum*, Hornsch. *Penzance*
 — *tenellum*, Bruch. *Bodmin Moors*

SCHISTOSTEGACEÆ

- Schistostega osmundacea*, Mohr. *Mount Edgcumbe, Penzance*

SPLACHNACEÆ

- Splachnum ampullaceum*, Linn. *Witbiel*

FUNARIACEÆ

- Funaria calcarea*, Wahl. *Endellion*
 — *ericetorum*, Dixon, var. *Curnowii*, Davies. *Penzance*
 — *fascicularis*, Schp. *Seaton, Penzance*
 — **Templetoni*, Sm. *Newlyn Cliff*

BARTRAMIACEÆ

- Philonotis rigida*, Brid. *Morvah, Mousehole*
Breutelia arcuata, Schp. *Witbiel, Helmentor*

BRYACEÆ

- Leptobryum pyriforme*, Wils. *Helmentor Moor, Redruth*
Webera albicans, Schp. *Anthony, Witbiel*
 — *annotina*, Schwgr. *Chyandour Moor*
 — *elongata*, Schweegr. *Lanivet*
Epipterygium Tozeri, Schp. *Saltash, Newlyn Cliff*
Zieria julacea, Schp. *Penzance (in fruit)*

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BRYACEÆ (continued)

- Bryum alpinum*, Huds. *Whitsand Bay, Boscastle*
 var. *meridionale*, Schp. *Land's End*
 — **Donianum*, Grev. *St. Minver, Newlyn Cliff* (in fruit)
 — *erythrocarpum*, Schwgr. *Lanivet, Penzance*
 — *filiforme*, Dick., var. *juliforme*, Dixon. *Carbis Bay*
 — *inclinatum*, Bland. *St. Minver, Lelant*
 — *intermedium*, Brid. *Bodmin, Hayle*
 — *murale*, Wils. *Bodmin, Newlyn Cliff*
 — *obconicum*, Hornsch. *Penvose, St. Tudy*
 — *pallens*, Sw. *Lanivet, Redruth*
 — *pallescens*, Schleich. *Truro*
 — *pseudo-triquetrum*, Schwgr., var. *compactum*, B. & S. *Halgaver Moor, Bodmin*
 — *roseum*, Schreb. *Endellion, St. Breock, Bodmin* (in fruit)
 — *torquescens*, B. & S. *Bodmin, Wadebridge*
Mnium cuspidatum, Hedw. *St. Minver, Long Rock near Marazion*
 — *rostratum*, Schrad. *St. Wenn*
 — *undulatum*, Hedw. *Bodmin* (in fruit)

FONTINALACEÆ

- Fontinalis antipyretica*, Linn. *St. Keyne's Well, Loe Pool*
 var. *gigantea*, Sull. *Withiel*
 var. *gracilis*, Schp. *Land's End*
 — *squamosa*, Linn. *Fowey River*
 var. *Curnowii*, Card. *Penzance*

CRYPHÆACEÆ

- Cryphæa heteromalla*, Mohr. *St. Minver*

NECKERACEÆ

- Neckera crispa*, Hedw. *St. Breock, Penzance*
 — *pumila*, Hedw. *Anthony, Penzance*
 var. *Philippeana*, Milde. *Withiel*
Homalia trichomanoides, Brid. *Bodmin, Penzance*

HOOKERIACEÆ

- Hookeria *lætevirens*, H. & T. *Mousehole* (in fruit)
Pterygophyllum lucens, Brid. *Mount Edgcumbe, Penzance*

LEUCODONTACEÆ

- Leucodon sciurioides*, Schwgr. *St. Minver*
Pterogonium gracile, Sw. *Withiel, Tolcarne*
Antitrichia curtipendula, Brid. *Rough Tor*
Porotrichum alopecurum, Mitt. *Bodmin, Penzance*

LESKEACEÆ

- Leskea polycarpa*, Ehrh. *Boscarne, Bodmin, Newlyn*

LESKEACEÆ (continued)

- Leptodon Smithii*, Mohr. *Saltash, St. Tudy*
Heterocladium heteropterum, B. & S. *Helmentor, Penzance*
*Thuidium *abietinum*, B. & S. *Lelant*

HYPNACEÆ

- Climacium dendroides*, W. & M. *Truro, Penzance*
*Orthothecium *intricatum*, B. & S. *Penzance*
Camptothecium lutescens, B. & S. *St. Minver, Hayle*
Brachythecium glareosum, B. & S. *Nanstallan Downs, Bodmin*
 — *illecebrum*, De Not. *Torpoint, Mousehole*
 — *plumosum*, B. & S. *Bodmin, Tolcarne near Penzance*
 — *populeum*, B. & S. *Bodmin*
 — *rivulare*, B. & S. *Bodmin, Castle Horneck*
 — **salebrosum*, B. & S. *Mousehole*
 var. *palustre*, Schp. *Connor Downs near Hayle*
Hyocomium flagellare, B. & S. *Bodmin, Trevayler*
Eurhynchium circinnatum, B. & S. *St. Minver* (in fruit), *Hayle*
 — *crassinervium*, B. & S. *Fowey, Penzance*
 — *hians*, Lesq. & James. *Penzance*
 — *megapolitanum*, Milde. *St. Breock, Hayle*
 — *murale*, Milde. *Penzance*
 — *piliferum*, B. & S. *Withiel, Cardinham*
 — *pumilum*, Schp. *Cardinham, Newlyn*
 — **speciosum*, Schp. *Bodmin, Newlyn*
 — **strigosum*, B. & S. *Truro* (the only British locality known)
 — **Teesdalei*, Schp. *Penzance*
 — *tenellum*, Milde. *Wadebridge*
Plagiothecium Borrerianum, Spr. *Bodmin, Penzance*
 — *sylvaticum*, B. & S. *Mount Edgcumbe, Penzance*
 — *undulatum*, B. & S. *Rough Tor, St. Breock*
 ? *Amblystegium confervoides*, B. & S. *Bodmin*
 — *filicinum*, De Not. *Bodmin*
 var. *Vallisclausæ*, Dixon. *St. Minver, Penzance*
 — *fluviale*, B. & S. *Camel River, Bodmin*
Hypnum aduncum, Hedw. *Chyandour Moor* (in fruit)
 var. *Kneiffii*, Schp. *St. Minver*
 — *chrysophyllum*, Brid. *St. Germans, Lelant*

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HYPNACEÆ (continued)

- Hypnum commutatum, Hedw. *Penzance*
- cordifolium, Hedw. *Chyandour Moor*
- *elodes, Spr. *Hayle*
- exannulatum, Güm. *Bodmin, Chyandour Moor*
- var. purpurascens, Dixon. *Land's End*
- *falcatum, Brid. *Penzance*
- *imponens, Hedw. *Helland*
- lycopodioides, Schwgr. *Hayle Kimbra near Lizard*
- ochraceum, Turn. *Tolcarne*
- palustre, Linn. *Withiel, Trengwainton*
- Patientiæ, Ldb. *Launceston, Truro*
- revolvens, Sw. *Bodmin, Chyandour Moor*
- var. Cossoni, Ren. *Penzance*

HYPNACEÆ (continued)

- *Hypnum sarmentosum, Wahl. *Bodmin, Trungle Moor*
- scorpioides, Linn. *Lanivet, Penzance*
- Sendtneri, Schp. *Halgaver Moor, Bodmin*
- stellatum, Schreb. *Withiel, Tremethick Moor*
- stramineum, Dicks. *Roscorla, Trengwainton*
- uncinatum, Hedw. *Launceston, St. Minver*
- Hylocomium brevirostre, B. & S. *Bodmin, Cardinham*
- loreum, B. & S. *Bodmin, Helland*

LIVERWORTS (*Hepaticæ*)

Although the Cornish list of *Hepaticæ* is not so rich as that of Devonshire, it contains some very rare species not recorded for the latter county. The rarest of these is perhaps *Scalia Hookeri*, found by Mr. W. Curnow on Chy-an-hal Moor, whence it has since disappeared. This species had previously only been found in the New Forest. It grows intermixed with *Aneura multifida* and is best recognized by its fleshy rooting base. *Petalophyllum Ralfsii* (first discovered by Dr. Ralfs) is another, less rare, but by no means common, occurring usually in the damp hollows of sand dunes in company with *Pallavicinia Hibernica* and *Fossombronina angulosa*. It was formerly found between Loggans Mill and Treeve, Phillack, and between Hayle Causeway and St. Erth, but the locality was subsequently destroyed. It has since been found on sand flats at Gwithian, and it is hoped that *Pallavicinia Hibernica* var. *Wilsoniana*, which was destroyed in the former localities, may again be detected elsewhere. The rare *Lejeunia calyptrifolia*, formerly found at Trevayler Bottom, has now disappeared. Several species not commonly found fertile occur in that state in Cornwall, of which may be mentioned *Plagiochila asplenioides*, *Lunularia vulgaris*, *Kantia arguta*, *Jungermannia inflata*, *Lepidozia setacea*, *Anthoceros lævis*, *A. punctatus*, and *Metzgeria furcata*. On the other hand some common species appear to be rare, or infertile: *Marchantia polymorpha* and *Reboulia hemisphærica* are rare, and *Fegatella conica* has not been noticed in fructification, although the male receptacles have been found occasionally. There is little doubt that careful search along the damp rocks near the sea would reveal several more species, especially those of a southern type. *Targionia Michelii* should certainly occur, as it is not infrequent around Plymouth Sound. Mr. Holmes also found a spiny *Riccia*, probably *R. ciliifera*, Link, on cliffs near Tintagel. It has been identified as *R. tumida* by Mrs. Tindall, but it is not purplish underneath as in that species. *Riccia crystallina* is not unlikely to occur on marshes near the sea. *Dumortiera irrigua*, which occurs in Devon, near Ilfracombe and Torquay, should also be found in Cornwall by streams near the sea. Mr. W. Curnow paid especial

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attention to this group of plants for many years, and his herbarium, in the form of a large album, now in the museum which Mr. W. E. Bailey has given to his native town, Mansfield, is probably the most perfectly mounted collection of British Hepaticæ ever made. From the delicacy of their fronds and the ephemeral nature of their delicate hyaline fruitstalks, they rarely retain their natural appearance in herbaria ; but Mr. Curnow's specimens are almost as perfect and recognizable as artistic illustrations in printed works. Many of them were cultivated on damp slate so as to free them from the soil, which adheres closely to their delicate rootlets under ordinary circumstances. No such carefully mounted collection exists even in our national herbaria. The classification and nomenclature in the following list are those of Pearson's *Hepaticæ of the British Isles*.

The Hepaticæ are well represented in Cornwall so far as the sub-alpine species are concerned, but alpine species and those favouring limestone are noticeably absent from the list. The rarer species are indicated by an asterisk prefixed to the name. Common species omitted from this list are fourteen in number.

JUNGERMANNIACEÆ

- Frullania *fragilifolia, Tayl. *Croft West, Kenwyn ; Gurnard's Head, Carn Galva, Scilly Isles*
- *germana, Tayl. *Mullion Cove*
- microphylla, Pears. *Lizard ; St. Mary's, Scilly Isles*
- Tamarisci, Dum. *Penzance*
var. cornubica, Carr. *Tredavoe, Paul*
- Jubula *Hutchinsiae, Dum. *Morvah*
- Lejeunia calyptrifolia, Dum. *Trevayler*
- Mackaii, Spreng. *Gulval Carn, Lizard*
- minutissima, Spruce. *Bologgas, Trevayler*
- Porella platyphylla, Lindb. *Clicker Tor (E.C.), Penzance*
- Thuja, Moore. *Lizard, Morvah*
- *pinnata, Lindb. *Clicker Tor, Menheniot*
*var. torva, Lindb. *Penzance*
- Blepharostoma trichophylla, Dum. *Trevello Carn, Morvah* (a stout form)
- Lepidozia *cupressina, Carr. *Carn Galva*
- Trichocolea tomentella, Nees. *Portreath, Chyandour*
- Bazzania trilobata, Carr. & Pears. *Carn Galva*
- Kantia arguta, Carr. & Pears. *Penzance*
- Sprengelii, Pears. *Penzance*
- Cephalozia bicuspidata, Dum. *Tredavoe, Paul*
var. viridis. *New Bridge, Penzance*
- byssacea, Dum. *Morvah, Kerris Moor*
- connivens, Spruce. *Carn Galva, Morvah*

- *Cephalozia dentata, Lindb. *Carbis Bay*
- divaricata, Dum. *Redruth, Penzance*
var. Curnowii, Slater. *Kynance*
- *Jackii, Limpr. *Hayle, Carbis Bay*
- *Lammersiana, Spr. *Marazion Marsh*
- Sphagni, Spr. *Trengwainton, Tremethick Moor, Carnagwidden, Gulval*
- *stellulifera, Tayl. MS. *Redruth, Lizard*
- Scapania compacta, Dum. *Kerris Moor, Chyandour Moor*
- purpurascens, Tayl. *Weir Head, Tamar River, Bodmin, Gurnard's Head*
- resupinata, Dum. *Trevayler, Trungle Moor*
- *uliginosa, Dum. *Gurnard's Head, St. Just*
- irrigua, Nees. *Marazion Marsh, Chyandour*
- undulata, Dum. *E.C., Bologgas, Trengwainton*
- Lophocolea *spicata, Tayl. *St. Just*
- Chiloscyphus polyanthus, Dum. *Trembath Mills, Stable Hobba, Skennels Bridge, Morvah*
- Plagiochila asplenoides, Dum. *Chyune Grove (in fruit), Paul*
- exigua, Tayl. *Carn Brea, Carn Galva*
- punctata, Tayl. " *Tredavoe, Carn Galva*
- spinulosa, Dum. " *Tredavoe, Carn Galva*
- tridenticulata, Tayl. *Carn Galva*
- Jungermannia affinis, Dum. *Seaton, Hayle Causeway, Lelant Ferry, Portreath, Carbis Bay*
- barbata, Schreb. *Trevayler*

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| <p> <i>Jungermannia crenulata</i>, Sm. <i>Redruth, Chacewater, Marazion Marsh</i> — <i>gracilis</i>, Schleich. <i>Penzance</i> — <i>inflata</i>, Huds. <i>Truro, Marazion Marsh</i> — <i>pumila</i>, With. <i>Truro, Helston</i> — <i>quinquedentata</i>, Carr. & Pears. <i>Truro, Penzance</i> — <i>riparia</i>, Dum. <i>Carbis Bay, St. Ives</i> — <i>turbinata</i>, Raddi. <i>Hayle Causeway, Lelant Bay</i> — <i>ventricosa</i>, Dicks. <i>Redruth, Penzance</i> <i>Saccogyna viticulosa</i>, Dum. <i>Trevayler</i> <i>Nardia emarginata</i>, Carr. <i>Newlyn Cliff</i> — <i>*hyalina</i>, Spruce. <i>Lower Ninnis, Madron</i> <i>Scalia Hookeri</i>, Carr. <i>Chy-an-bal Moor</i> <i>Fossombronia *angulosa</i>, Raddi. <i>Trelissick, Kymyal Cliff, Mousehole (in fruit), Lamorna, Hayle, Land's End</i> <i>Petalophyllum *Ralfsii</i>, Gottsche. <i>Near Phillack and near St. Erth, Gwithian</i> <i>Pellia calycina</i>, Nees. <i>Marazion, Newlyn Cliff</i> <i>Pallavicinia *hibernica</i>, Hook., var. <i>Wilsoniana</i>, Gottsche. <i>Near Phillack, Hayle Sands</i> </p> | <p> <i>Blasia pusilla</i>, Linn. <i>Trembath, Chy-an-bal, Trungle Moor, Madron, Gurnard's Head</i> <i>Metzgeria furcata</i>, Linn. <i>Penzance</i> var. <i>æruginea</i>, Hook. <i>W.C.</i> <i>Aneura *ambrosioides</i>, Nees — <i>bipinnata</i>, Mitt. <i>Mousehole</i> — <i>multifida</i>, Dum. <i>Mousehole, W.C.</i> — <i>pinguis</i>, Dum. <i>Hayle, Land's End</i> <i>Lunularia vulgaris</i>, Mich. <i>Castle Horneck, Trengwainton (in fruit)</i> <i>Reboulia hemisphærica</i>, Raddi. <i>Paul Hill, Chyune Hill</i> <i>Fegatella conica</i>, Tayl. <i>Hayle</i> <i>Riccia glauca</i>, Linn. <i>W.C.</i> — <i>*bifurca</i>, Hoffm. <i>Penzance</i> — <i>*ciliifera</i>, Link. <i>Trebarwith near Tintagel</i> — <i>*glaucescens</i>, Carr. <i>Newlyn Cliff</i> — <i>*sorocarpa</i>, Bisch. <i>Chyune Grove, Paul</i> — <i>*tumida</i>, Link. <i>Penzance</i> <i>Anthoceros *lævis</i>, Linn. <i>Stable Hobba, Trungle</i> — <i>*punctata</i>, Linn. <i>W.C.</i> </p> |
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MARINE ALGÆ

The earliest contributor to a knowledge of the Marine Algæ of Cornwall was probably Mr. J. Stackhouse of Pendarves, who, at the end of the seventeenth century published a work on Marine Algæ entitled *Nereis Britannica*, containing numerous illustrations. It is stated in the *Bibliotheca Cornubiensis* that Mr. Stackhouse built Acton Castle for the purpose of pursuing his researches on Marine Algæ, and he was probably the first to experiment on the propagation of algæ from their spores. In the early part of the last century Miss Warren of Flushing paid much attention to this group of plants, and sent many specimens to the late Professor Harvey of Dublin, whose *Phycologica Britannica* still remains the classical work on British Marine Algæ. Desirous of recognizing the valuable assistance he received from her he honoured her name by giving it to a species which he believed to be new, viz. *Schizosiphon Warreniæ*, but which, unfortunately, owing to the recently accepted laws of priority of nomenclature, has been altered to *Rivularia Biasolettiæ*, Menegh., a name previously given to it by an Italian botanist. Dr. Herman Becker, F.L.S., also studied the marine flora of Cornwall and added to it the very rare *Desmarestia Dresnayi*, Lamour, which he dredged off the Lizard in December 1864. In more recent years Dr. W. P. Cocks, late of Plymouth and Falmouth, and the Rev. W. S. Hore explored that portion of Cornwall between Mount Edgcumbe and Saltash. Mr. Henry Goode worked the same district and also the neighbourhood of Penzance in west Cornwall, where he was fortunate enough to meet with the rare *Carpomitra Cabrerae* and *Stenogramme interrupta*, thrown up after storms. Mr. F. W. Smith for many years collected marine algæ at Falmouth, but unfortunately did not examine them microscopically,

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nor did Mr. H. Goode, and as the two gentlemen exchanged specimens, and the latter obtained many foreign species, which were not always labelled with their localities, some little doubt pertains to some of the specimens distributed by Mr. Smith. For many years Dr. J. Ralfs, a most accurate botanist, explored the marine flora of west Cornwall, in company with Mr. E. D. Marquand and Mr. W. Curnow. Mr. A. Henwood Teague for a short time collected algæ in Mount's Bay and added the new British species *Peyssonelia atropurpurea*, Crn. Mr. R. V. Tellam has added many species to the Cornish flora, and not a few of the records from Saltash, Fowey, Looe, Pridmouth, Par, Falmouth and Padstow are the result of his long continued and persevering research. Mr. E. M. Holmes has also visited Mount Edgcumbe, Torpoint, Looe, Fowey, Falmouth, the Lizard, Penzance, Padstow, Newquay and Boscastle, and is therefore able to confirm many of the Cornish records from these localities. Some of the rarities found in these places have been issued in the ten fasciculi of Holmes' *Algæ Britannicæ rariores*. In the following list these are indicated by the letter 'H' followed by their number in the fasciculi. The algæ of the Scilly Islands have been but little investigated. Mr. Jesse Robbins, formerly of Kew Gardens, collected at Tresco in 1885, where he found the rare *Gigartina pistillata*. The late Mr. E. George visited the islands in 1899 and 1900, and discovered a species new to science, which has been named after him *Rhodophysema Georgii* by Dr. E. A. L. Batters. Another interesting species found by him in the same islands is a species described by Kützinger under the name of *Phycolapathum crispatum*. This species had been lost sight of as a European plant for nearly fifty years until its rediscovery by Mr. George. It has since been referred to another genus by Dr. Batters as *Punctaria crispata*. One of the most interesting discoveries made in this county was that of a Japanese seaweed, found by the late Mr. T. H. Buffham, F.L.S., amongst rejectamenta at Falmouth. It is furnished with remarkable hooked branchlets, by the development of which into narrowing rings the plant attaches itself firmly to other algæ, and continues its growth. In 1900 Mr. Holmes in company with Mr. George found the plant actually growing in considerable quantity at Falmouth, and the previous year it was found by Mr. George at Shanklin; so that the plant has evidently become naturalized in this country, and is the first instance of a naturalized alga on record, although there is a possibility that *Nitophyllum venulosum*, which Mr. Holmes found growing at Whitsand Bay, but elsewhere known only from the Adriatic, as well as *Stenogramme interrupta* dredged at Plymouth, Penzance and Wicklow in Ireland, but which is a native of the Australian seas, may have been naturalized many years ago in this country.

The species at present restricted to Cornwall but which may possibly be hereafter found in other counties are :—

Ectocarpus Stilophoræ, Crn., f. *cervicornis*,
Batt.
Hymenoclonium serpens, Batt.
Nemastoma marginifera, J. Ag.

Nitophyllum venulosum, Zan.
Punctaria crispata, Batt.
Rhizoclonium riparium, var. *Casparyi*,
Holm. & Batt.

BOTANY

Of these the first was detected by the late Mr. T. H. Buffham; the second was recognized as new to Britain by Mr. Holmes, and identified as *Callithamnion serpens*, Crn. by Dr. Batters, and placed by him in a new genus, *Hymenoclonium*. The third was detected by Professor W. G. Farlow of Harvard University amongst specimens sent him from Plymouth. The fourth was described as new by Mr. Holmes under the name of *N. thysanorrhizans*, but was subsequently found to be an Adriatic species previously described by Zanardini under the name of *N. venulosum*. Elsewhere in Europe it is only known from that sea. The fifth, *Punctaria crispata*, was found by the late Mr. E. George, and the sixth by the late Dr. Caspary.

The general character of the Cornish Marine Algæ is that of the algal flora of the north and central French coasts, the influence of the Gulf Stream being also decidedly shown by the number of south European species met with. Several northern species that are generally regarded as outside the flora of southern England have been reported to occur in Cornwall, but the records must be received with some hesitation until further confirmation is obtained. These are *Phyllophora Brodiaei*, which Mr. Holmes has never seen further south than Anglesea; *Delesseria angustissima*, not reported south of Yorkshire; *Cbordaria divaricata*, not collected south of Ayrshire; *Ptilota plumosa* and *Dictyosiphon Ekmani*, which are distinctly northern species. Others, frequent on Spanish and Mediterranean shores, including *Gigartina pistillata* and *Carpomitra Cabrerae*, etc., may possibly find their northern limit in this county. There are probably still many species to be detected by careful dredging off the Cornish coast, especially at Penzance and Falmouth, since by dredging many new species have been added to the Devonshire flora by the researches of workers in the Marine Biological Laboratory at Plymouth.

The classification followed is that given in Holmes and Batters' 'Revised List of British Marine Algæ' published in the *Annals of Botany*, v. 63-107, with a few emendations, in accordance with the names now adopted in Engler's *Natürlichen Pflanzen-Familien*, but it has not been deemed useful to adopt the changes of well-known specific names as given by Dr. Batters in the *Journal of Botany* for December 1902, pp. 99-100, except where necessitated by the adoption of a new genus generally recognized by algologists. The species common all round the coasts of Great Britain are omitted to the number of eighty-five. The rarer species are indicated by an asterisk. The letters 'B.M.' indicate that a specimen has been seen in the British Museum by Mr. Holmes.

The following species are found only in a few other counties:—

| | | | |
|------------------------------|---------|---------------------------------|----------------|
| Bonnemaisonia hamifera, Har. | Devon, | Acrochætium microscopicum, Näg. | Devon, |
| Hampshire | | Northumberland | |
| Calothrix parasitica, Thur. | Dorset | Bornetia secundiflora, Thur. | Devon, Channel |
| Carpomitra Cabrerae, Kütz. | Devon | Islands | |
| Acrochætium luxurians, Näg. | Dorset, | Ceramium Crouanianum, J. Ag. | Devon |
| Channel Islands | | Cladophora Brownii, Harv. | Devon, Wicklow |

A HISTORY OF CORNWALL

Crouania attenuata, J. Ag. *Devon, Channel Islands*
Desmarestia Dresnayi, Lamour. *Devon, Ireland*
Ectocarpus Stilophoræ, Crn. *Dorset*
Erythropeptis discigera, Schm. *Kent*
— *ciliaris*, Batt. *Scotland*
Gelidium sesquipedale, Thur. *Devon*
Griffithsia Devoniensis, Haw. „
Hæmatocelis rubens, J. Ag. *Northumberland*
Helminthocladia Hudsoni, J. Ag. *Devon*
Nitophyllum literatum, J. Ag. *Devon*

Monostroma crepidinum, Farl. *Sussex*
— *orbiculatum*, Thur. *Dorset*
Peyssonelia atropurpurea, Crn. *Channel Islands*
— *Harveyana*, Crn. *Devon*
— *Rosenvingii*, Schm. *Devon, Dorset, Northumberland*
Polysiphonia ceramiiformis, Crn. *Dorset*
— *foetidissima*, Cocks. *Devon, Sussex*
— *Rhunensis*, Thur. *Devon*
Rhodophysemia Georgii, Batt. *Devon*
Stenogramme interrupta, Mont. *Devon, Ireland*

CYANOPHYCEÆ

CHAMÆSIPHONACEÆ

Dermocarpa prasina, Born. *Padstow*

OSCILLATORIACEÆ

Oscillatoria margaritifera, Kütz. *Saltash*
Phormidium papyraceum, Gom. *Saltash, Penzance*
— *autumnale*, Gom. *Padstow, Falmouth, Penzance*
Lyngbya majuscula, Harv. *Marazion*
Symploca hydroides, Kütz. *Saltash, Fowey, Padstow, Penzance*
Microcoleus chthonoplastes, Thur. *Looe*

RIVULARIACEÆ

Calothrix parasitica, Thur. *Porth Cressa, Scilly Isles*
— *æruginea*, Thur. *Padstow*
Rivularia Biasolettiiana, Menegh. *Wadebridge, Padstow, Falmouth, Penzance*
— *nitida*, C. Ag. *Saltash, Padstow, Hayle, Marazion*
— *bullata*, Berk. *Looe, Fowey, St. Minver, Marazion*

NOSTOCACEÆ

Anabæna variabilis, Kütz. *Hayle, Penzance*
— *torulosa*, Lagenh. *Penzance*

CHLOROPHYCEÆ

ULVACEÆ

Monostroma laceratum, Thur. *Wadebridge, Lostwithiel, H. 15*
— **crepidinum*, Farl. *Falmouth*
— *Wittrockii*, Born. *Saltash, Fowey*
— *Grevillei*, With. *Falmouth*
— **orbiculatum*, Thur. *Falmouth*
Enteromorpha clathrata, J. Ag. *Cawsand, Falmouth, Penzance*
— *Linkiana*, Grev. *Padstow, Fowey, Looe*
— *prostrata*, Le Jol. *Looe, Falmouth*
— *Hopkirkii*, Mac Calla. *Looe*
— *Linza*, J. Ag. *Looe, Penzance*
— *erecta*, J. Ag. *Whitsand Bay, Fowey, Falmouth*
— *torta*, Reinb. *Wadebridge*

ULVACEÆ (continued)

Enteromorpha ramulosa, Harv. *Falmouth; St. Martin's, Scilly Isles*
var. *tenuis*, Hauck. *Scilly Isles*
— **usneoides*, J. Ag. *St. Martin's, Scilly Isles*
Ulva lactuca, Linn. *Falmouth (rare)*
— *myriotrema*, Born. „ „

ULOTHRIXACEÆ

*Ulothrix *speciosa*, Kütz. *Mount's Bay*
— *implexa*, Kütz. *Looe*

CHÆTOPHORACEÆ

*Tellamia *contorta*, Batt. *Padstow, Falmouth*
— **intricata*, Batt. *Padstow, Falmouth*

CLADOPHORACEÆ

Urospora isogona, Batt. *Par, Penzance*
Chætomorpha tortuosa, Kütz. *Looe, Fowey, Falmouth, Mount's Bay*
— *sutoria*, Berk. *Penzance*
— *Melagonium*, Kütz. *St. Minver, Newquay, Lizard, Mount's Bay; Tresco, Scilly Isles*
Rhizoclonium implexum, Batt. *Mount Edgumbe, Penzance*
— *arenosum*, Kütz. *Talland Bay*
— *arenicola*, Reinb. *Marazion*
var. *Casparyi*, Holm. & Batt. *Padstow, Falmouth, Penzance*
Cladophora pellucida, Kütz. *Looe, Fowey, Falmouth, Penzance*
— *Hutchinsiae*, Harv. *Fowey, Falmouth, Scilly Isles*
— *diffusa*, Holm. & Batt. *Falmouth*
— **rectangularis*, Harv. *Whitsand Bay, Scilly Isles*
— *hirta*, Kütz. *Looe, Fowey, Falmouth, Penzance, Land's End*
— *utriculosa*, Kütz. *Scilly Isles*
— **trichocoma*, Kütz. *Falmouth*
— *gracilis*, Kütz. *Looe, Falmouth, Penzance*
— *sericea*, Kütz. *Looe, Padstow, Fowey, Falmouth, Penzance*
— **glaucescens*, Harv. *Looe, Falmouth, Penzance*

BOTANY

CLADOPHORACEÆ (continued)

- Cladophora flexuosa*, Harv. *Looe, Fowey, Falmouth, Penzance*
 — **Rudolphiana*, Harv. *Falmouth* (scarce)
 — **Brownii*, Harv. *Mousehole near Penzance*

BRYOPSIDACEÆ

- Bryopsis *hypnoides*, Lam. *Looe, Fowey, Falmouth, Penzance, Scilly Isles*

VAUCHERIAEÆ

- Vaucheria sphærospora*, Nordst., f. *synoica*, Nordst. *Saltsb*
 f. *dioica*, Rosenv. *Saltsb, Fowey*
 — *Thureti*, Woron. *Falmouth*

CODIACEÆ

- Codium *adhærens*, C. Ag. *Fowey, Falmouth, Land's End, Sennen Cove*
 — **amphibium*, Holm. & Batt. *Falmouth*
 — *tomentosum*, Stackh. *Looe, Padstow, Fowey, Falmouth, Penzance, Scilly Isles*
 — *Bursa*, C. Ag. *Coasts of Cornwall*, (Batters' Catalog. p. 22)

PHÆOPHYCEÆ

DESMARESTIACEÆ

- Desmarestia viridis*, Lamx. *Looe, Padstow, Falmouth, Trefusis, Penzance*
 — **Dresnayi*, Lamx. *Lizard*

PUNCTARIACEÆ

- Phæostroma pustulosum*, Kuck. *Scilly Isles*
Litosiphon pusillus, Harv. *Looe, Padstow, Falmouth, Penzance, Scilly Isles*
 — *Laminariæ*, Harv. *Looe, Fowey, Boscastle, Padstow, Penzance, Scilly Isles*
Phlæospora brachiata, Born. *Mount Edgcumbe, Fowey, Falmouth, Helford River, Lizard, Penzance, H. 250*
*Stictyosiphon *sub-articulatus*, Hauck. *Boscastle, Falmouth*
Striaria attenuata, Grev. *Torpoint, Boscastle, Falmouth*
 var. *crinita*, J. Ag. *Boscastle*
Punctaria latifolia, Grev. *Looe, Falmouth, Marazion*
 — *tenuissima*, Grev. *Boscastle, Falmouth*
 — **crispata*, Batt. *Scilly Isles* (E. George), H. 247

SCYTOSIPHONACEÆ

- Phyllitis Fascia*, Kütz. *Looe, Padstow, Penzance*

ASPEROCOCCACEÆ

- Asperococcus bulbosus*, Lamour. *Looe, Falmouth, Penzance*
 — **compressus*, Griff. *Boscastle, Pridmouth, Falmouth, Marazion*

ECTOCARPACEÆ

- Strepsithalia *Buffhamiana*, Batt. *Falmouth*

ECTOCARPACEÆ (continued)

- Streblonema *Zanardini*, Crn. *Falmouth, H. 249*
Ectocarpus Stilophoræ, Crn. *Falmouth*
 var. *cervicornis*, Batt. „
 — *tomentosoides*, Farl., var. *punctiformis*, Batt. *Penzance*
 — *velutinus*, Kütz. *Looe, Fowey, Penzance*
 — *simpliciuscula*, C. Ag. *Marazion*
 — *simplex*, Crn. *Fowey, Padstow, Falmouth, Lizard, H. 8*
 — *repens*, Rke. *Boscastle, Fowey, Pridmouth, Falmouth*
 — **microspongium*, Batt. *Mount Edgcumbe*
 — *terminalis*, Kütz. *Bude, Padstow, Newquay, Looe, Fowey, H. 36*
 — *globifer*, Kütz. *Pridmouth, Falmouth*
 var. *rupestris*, Batt. *Boscastle, Padstow, Newquay, Penzance, H. 62*
 — **Sandrianus*, Zan. *Pridmouth, Falmouth*
 — *Crouani*, Thur. *Boscastle*
 — *siliculosus*, Kütz.
 var. *typica*, Kjellm. *Looe, Padstow, Falmouth, Penzance*
 var. *spalatina*, Kjellm. *Boscastle, Fowey, Marazion, H. 81*
 var. *longipes*, Harv. *Fowey, Padstow*
 — *secundus*, Kütz. *Looe*
 — *hiemalis*, Kuck. *Padstow*
 — *penicillata*, C. Ag. *Cawsand*
 — *fasciculatus*, Harv., f. *congesta*, Crn. *Lizard, Penzance, H. 238*
 var. *draparnaldioides*, Crn. *Falmouth*
 — *Hincksia*, Harv. *Looe, Fowey, Falmouth, Penzance*
 — **fenestratus*, Berk. *Bude*
Pylaiella littoralis, Kjellm., var. *firma*, Kjellm. *Whitsand Bay, Looe, Padstow, Falmouth, Penzance*
 var. *ramellosa*, Holm. & Batt. *Par, Padstow, Newquay*
Isthmoplea sphærophora, Kjellm. *Cawsand, Looe, Boscastle, Padstow, Falmouth, Lizard, Penzance, Land's End*
*Myriotrichia *densa*, Batt. *Scilly Isles*
 — *repens*, Hauck. *Padstow, Falmouth*

ARTHROCLADIACEÆ, Thur.

- Arthrocladia *villosa*, Duby. *Torpoint, Padstow, Falmouth, Penzance*

ELACHISTACEÆ, Rke.

- Myriactis pulvinata*, Kütz. *Looe, Padstow, Fowey, Falmouth, Penzance*
 — **stellulata*, Duby. *Falmouth*
*Elachista *flaccida*, Aresch. *Looe, Padstow, Penzance*
 — *scutulata*, Duby. *Looe, Fowey, Falmouth, Lizard, Penzance*
*Halothrix *lumbricalis*, Rke. *Padstow*

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SPHACELARIACEÆ

- Sphacelaria radicans*, Harv. *Par, Pridmouth, Falmouth, Penzance, Sennen Cove*
 — *olivacea*, Pringsh. *Par, Pridmouth*
 — *cirrhusa*, Ag. *Falmouth, Lizard*
 var. pennata, Hauck. *Looe, Padstow, Falmouth, Penzance*
 var. fusca, Holm. & Batt. *Padstow, Falmouth, Penzance, Land's End*
 — **plumula*, Zan. *Pridmouth, Falmouth*
*Halopteris *filicina*, Kütz. *Boscattle, Padstow, Looe, Falmouth, Penzance*
Stypocaulon scoparium, Kütz. *Looe, Padstow, Falmouth, Penzance, Scilly Isles*

MYRIONEMACEÆ

- Myrionema *æcidoides*, Sauv. *Falmouth*
Ulonema rhizophorum, Fosl. *Falmouth, Lizard*
*Chilionema *Nathaliae*, Sauv. *Looe*
Ascocyclus orbicularis, Magn. *Scilly Isles*
 — **sphærophorus*, Sauv. *Scilly Isles*
Ralfsia clavata, Crn. *Fowey, Falmouth, Penzance*

CHORDARIACEÆ

- Spermatochnus *paradoxus*, Rke. *Torpoint, Falmouth*
*Stilophora *Lejolisii*, Rke. *Looe, Falmouth*
 (?) *Chordaria divaricata*, C. Ag. *Falmouth*
*Mesogloia *Griffithsiana*, Grev. *Falmouth, Penzance*
Castagnea Zosteræ, Thur. *Penzance, Scilly Isles*
*Petrospongium *Berkeleyi*, Näg. *Boscattle, Padstow, Looe, Penzance*

SPOROCHNACEÆ

- Sporochnus *pedunculatus*, C. Ag. *Torpoint, Falmouth*
*Carpomitra *Cabreræ*, Kütz. *Fowey, Penzance*

CHORDACEÆ

- Chorda filum*, Stackh., *var. thrix*, W. Hook. *Penzance*
 — **tomentosa*, Lyngh. *Boscattle*

LAMINARIACEÆ

- Laminaria saccharina*, Lamx. *Fowey, Falmouth, Penzance*
 var. phyllitis, Le Jol. *St. Minver, Looe*
Saccorhiza bulbosa, De la Pyl. *Cawsand, Fowey, Looe, Padstow, Falmouth, Penzance*
Alaria esculenta, Grev. *Boscattle, Fowey, Falmouth, St. Ives, Padstow, Lizard, Penzance, Land's End*

CUTLERIACEÆ, Thur.

- Cutleria multifida*, Grev. *Falmouth*
 f. reptans, Reink. *Fowey, Padstow, Falmouth, Penzance*

FUCACEÆ

- Fucus ceranoides*, Linn. *Fowey, Falmouth*

FUCACEÆ (continued)

- Fucus platycarpus*, Thur. *Fowey, Penzance*
 var. spiralis (Linn.) *Fowey, Falmouth*
 — *vesiculosus*, Linn., *var. sphærocarpus*, J. Ag. *Cornwall*
 — *serratus*, Linn., *var. angustifrons*, Stackh. *Falmouth*
 var. integer, Turn. *St. Ives*
*Bifurcaria *tuberculata*, Stackh. *Boscattle, Padstow, Looe, Fowey, Falmouth, Lizard, St. Ives, Penzance*
Himanthalia lorea, Lyngh. *Looe, Fowey, Padstow, Lizard*
*Cystoseira *ericoides*, C. Ag. *Whitsand Bay, Looe, Padstow, Falmouth, Penzance*
 — **granulata*, C. Ag. *Looe, Fowey, Padstow, Falmouth, Penzance*
 — **discors*, C. Ag. *Padstow, Falmouth*
 — *fibrosa*, C. Ag. *Looe, Padstow, Falmouth, Penzance*

TILOPTERIDACEÆ

- Tilopteris Mertensii*, Kütz. *Mount Edgumbe, Falmouth, Penzance*
*Akinetospora *pusilla*, Born. *Cawsand, Boscattle, Newquay, Penzance, Land's End*

DICTYOTACEÆ

- Dictyota dichotoma*, Lam., *var. implexa*, J. Ag. *Padstow, Falmouth*
 var. latifrons, Holm. & Batt. *Falmouth, Penzance, Scilly Isles*
*Taonia *atomaria*, J. Ag. *Padstow, Penzance*
*Padina *pavonia*, Gaill. *Boscattle*
*Dictyopteris *polypodioides*, Lamx. *St. Austell Bay*

RHODOPHYCEÆ

PORPHYRACEÆ

- Goniotrichum *elegans*, Le Jol. *Padstow*
*Erythropeltis *discigera*, Sch., *var. flustræ*, Batt. *Scilly Isles*
Erythrotrichia carnea, J. Ag. *Looe, Fowey, Falmouth, Penzance*
 — **ciliaris*, Batt. *Scilly Isles*
 — **Bertholdi*, Batt. *Falmouth, Helford, Scilly Isles*
 — **ceramicola*, Ralfs. *Falmouth, Penzance*
 — **Boryana*, Berth. *Scilly Isles*
Bangia fusco-purpurea, Lyngh., *var. crispa*, Holm. & Batt. *Padstow*
 — **lutea*, J. Ag. *Marazion (B.M.)*
Porphyra leucosticta, Thur. *Mount Edgumbe, Falmouth, Scilly Isles*
 — *linearis*, Grev. *Pridmouth, Falmouth, Penzance*

HELMINTHOCLADIACEÆ

- Acrochætium microscopicum*, Näg. *Kynance, Penzance*

BOTANY

HELMINTHOCADIACEÆ (continued)

- Acrochæcium virgatulum*, J. Ag. *Torpoint, Looe, Padstow, Falmouth*
 — *secundatum*, Näg. *Whitsand Bay, Looe, Penzance*
 — *luxurians*, Näg. *Mount Edgcumbe*
 — *Daviesii*, Näg. *Looe, Padstow, Falmouth, Penzance*
 — *sparsum*, Batt. *Mount's Bay*
Nemalion lubricum, Duby. *Falmouth, Land's End, Scilly Isles*
 — *multifidum*, J. Ag. *Whitsand Bay, Pridmouth, Padstow, Falmouth*
Helminthocladia **purpurea*, J. Ag. *Penzance, Whitsand Bay*
 — **Hudsoni*, J. Ag. *Whitsand Bay, Sennen Cove*
Helminthora divaricata, J. Ag. *Whitsand Bay, Padstow, Pridmouth, Falmouth, Penzance, Scilly Isles*

CHÆTANGIACEÆ

- Scinaia* **furcellata*, Bivona. *Torpoint, Penzance, Scilly Isles*

GELIDIACEÆ

- Naccaria* **Wiggii*, Endl. *Mount Edgcumbe, Fowey, Falmouth, Penzance*
Pterocladia capillacea, Born. *Mount Edgcumbe, Lizard, Penzance*
Gelidium crinale, J. Ag. *Padstow, Looe*
 — *pusillum*, Le Jol. *Penzance*
 — *aculeatum* (Grev.) *Pridmouth, Falmouth, Penzance, Scilly Isles*
 var. abnorme, Batt. *North Cornwall, Penzance*
 — *pulchellum*, Kütz. *Falmouth, Lizard, Penzance*
 — *attenuatum*, Thur., *var. confertum*, Batt. *Falmouth*
 — *corneum*, Lamour. *Padstow, Falmouth*
 — *latifolium*, Born. *Fowey, Padstow, Falmouth, Penzance*
 var. flexuosum, Batt. *Mount Edgcumbe, Newquay*
 — *sesquipedale*, Thur. *Lizard, Scilly Isles*

GIGARTINACEÆ

- Chondrus crispus*, Stackh. *Looe, Padstow, Falmouth, Penzance*
 f. virens, Turn. *Cornwall (Batters)*
 f. æqualis, Turn. *Falmouth*
Gigartina **acicularis*, Lamour. *Penzance*
 — **pistillata*, Stackh. *Whitsand Bay, Padstow, Lizard, St. Ives, Penzance, Scilly Isles, H. 65*
 — *mammillosa*, J. Ag., *f. acuta*, Good. & Woodw. *Falmouth*
 f. prolifera, Turn. *Looe, Falmouth*
 f. incurvata, Turn. *Cornwall*
Phyllophora (?) *Brodiei*, J. Ag. *Falmouth*
 — **Traillii*, Holm. & Batt. *Mount Edgcumbe, Fowey, Falmouth, Lizard*

GIGARTINACEÆ (continued)

- Phyllophora palmettoides*, J. Ag. *Whitsand Bay, Padstow, Penzance*
Stenogramme **interrupta*, Mont. *Torpoint, Mount Edgcumbe, Penzance*
Gymnogongrus **Griffithsia*, Mont. *Mount Edgcumbe, Fowey, Padstow, Penzance*
 — *Norvegicus*, J. Ag. *Boscastle, Talland Bay, Falmouth, Penzance*
 — *patens*, J. Ag. *Padstow*
Actinococcus subcutaneus, Rosenv. *Falmouth*
 — *aggregatus*, Schm. *Penzance*
 — *peltæformis*, Schm. *Falmouth*
Callocolax neglectus, Schm. *Falmouth, Penzance*
Colacolepis incrustans, Schm. *Falmouth*
Sterrocolax decipiens, Schm. *On Ahnfeltia plicata*
Callophyllis laciniata, Kütz. *St. German's River, Looe, Falmouth, Lizard, Penzance*

RHODOPHYLLIDACEÆ

- Catenella Opuntia*, Grev. *Fowey, Penzance*
Rhodophyllis bifida, Kütz. *Torpoint, Boscastle, Padstow, Looe, Falmouth, Penzance*
 var. incrassata, Harv. *Falmouth, Scilly Isles*
 — **appendiculata*, J. Ag. *Pridmouth, Penzance*

SPHÆROCOCCACEÆ

- Sphærococcus coronopifolius*, Grev. *Looe, Padstow, Pridmouth, Falmouth, Penzance*
Gracilaria **dura*, C. Ag. *Padstow*
 — **compressa*, Grev. *Penzance*
 — **multipartita*, J. Ag. *Whitsand Bay, Torpoint*
Calliblepharis ciliata, Kütz. *Fowey, Padstow, Falmouth, Penzance*
 — *jubata*, Kütz. *Looe, Fowey, Falmouth, Scilly Isles*
 var. dilatata, Holm. & Batt. *Coast of Cornwall (Batters)*

RHODYMENIACEÆ

- Rhodymenia palmata*, Grev., *f. sobolifera*. *Padstow, Falmouth*
 — *palmetta*, J. Ag., *f. acutifolia*, Kütz. *Lizard*
 f. discocarpa, Kütz. *Penzance*
 f. flabelliformis, Kütz. *Padstow, Newquay, Pridmouth, Scilly Isles*
 f. spathulata, Kütz. *Falmouth*
 f. subdivisa, Kütz. *Newquay*
 — *Nicæensis*, Holm. *Pridmouth*
 — **ligulata*, Zan. *Falmouth*
Cordylecladia **erecta*, J. Ag. *Falmouth*

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RHODYMENIACEÆ (continued)

- Lomentaria clavellosa*, Gaill. *Torpoint, Padstow, Falmouth, Penzance*
 var. *sedifolia*, Harv. *Falmouth*
 — **rosea*, Thur. *Mount Edgumbe, Boscastle, Padstow, Lizard, Penzance, H. 78*
Champia parvula, Lamx. *Padstow, Lizard, Penzance*
 var. *implexa*, Batt. *Padstow*
Chylocladia kaliformis var. *squarrosa*, Harv. *Penzance, Porthcurnow*
 — *ovalis*, W. Hook. *Saltash, Looe, Boscastle, Padstow, Falmouth, Lizard, Penzance*
 — **reflexa*, Lenorm. *Padstow, Penzance Bay*

DELESSERIACEÆ

- Nitophyllum* **Bonnemaisoni*, Grev. *Fowey, Falmouth, Penzance*
 var. *crassinerve*, Batt. *Falmouth, Penzance, Scilly Isles*
 — *Gmelini*, Harv. *Torpoint, Pridmouth, Falmouth, Lizard, Penzance*
 — *Hillia*, Grev. *Fowey, Falmouth, Penzance, Scilly Isles*
 — *laceratum*, Grev., f. *miniaturum*, Grev. *Lizard, Penzance*
 var. *uncinatum*, Grev. *Padstow, Lizard*
 — **litteratum*, J. Ag. *Scilly Isles*
 var. *ocellatum*, J. Ag. *Padstow, Penzance*
 var. *Pollexfenii*, Harv. *Torpoint*
 — *punctatum*, Grev. *Torpoint, Padstow, Falmouth, Penzance*
 — *reptans*, Crn. *Pridmouth*
 — **Sandrianum*, Zan. *Falmouth*
 — **venulosum*, Zan. *Torpoint, Whitsand Bay, H. 219*
 — **versicolor*, Harv. *Pridmouth, Penzance*
Gonimophyllum **Buffhanii*, Batt. *Scilly Isles*
Delesseria (?) *angustissima*, Griff. *Penzance (R.V.T.)*
 — *Hypoglossum*, Lam. *Torpoint, Padstow, Falmouth*
 f. *crispa*, Crn. *Falmouth*
 f. *arborescens*, J. Ag. *Falmouth*
 — *ruscifolia*, Lam. *Fowey, Torpoint, Boscastle, Padstow, Falmouth, Penzance*

BONNEMAISONIACEÆ

- Bonnemaisonia asparagoides*, C. Ag. *Torpoint, Looe, Falmouth, Penzance, Scilly Isles*
 — **hamifera*, Hariot. *Falmouth*

RHODOMELACEÆ

- Bostrychia scorpioides*, Mont. *Fowey*
Rhodomela subfusca, C. Ag., f. *firmior*, J. Ag. *Falmouth*

RHODOMELACEÆ (continued)

- Rhodomela* (?) *lycopodioides*, C. Ag. *Padstow, Falmouth*
Laurencia obtusa, Lam. *Falmouth, Penzance*
 var. *pyramidata*, J. Ag. *Scilly Isles*
 — *hybrida*, Lamx. *Looe, Falmouth, Penzance*
Chondria **tenuissima*, C. Ag. *Falmouth*
 — *dasyphylla*, C. Ag. *Whitsand Bay, Looe, Padstow, Falmouth, Penzance*
Polysiphonia macrocarpa, Harv. *Whitsand Bay, Looe, Padstow, Fowey, Falmouth, Penzance, Land's End*
 — **Rhunensis*, Born. *Padstow, Falmouth*
 — **foetidissima*, Cocks. *St. Germans River, Falmouth, Newlyn West*
 — *urceolata*, Grev.
 var. *formosa*, J. Ag. *Torpoint*
 var. *patens*, J. Ag. *Padstow*
 var. *roseola*, J. Ag. *Cawsand, Padstow*
 — *elongella*, Harv. *Torpoint, Talland Bay, Padstow, Falmouth*
 — *violacea*, Wyatt. *Torpoint, Looe, Padstow, Falmouth, Penzance*
 var. *allochroa*, J. Ag. *Falmouth*
 — *fibrillosa*, Grev. *Whitsand Bay, Padstow, Looe, Falmouth, Penzance*
 — **variegata*, J. Ag. *Torpoint, St. Germans River, Padstow*
 — **furcellata*, Harv. *Falmouth*
 var. *patula*, J. Ag. *Falmouth, H. 71*
 var. *forcipata*, J. Ag. *Falmouth*
 — **ceramiiformis*, Crn. *Falmouth*
 — *simulans*, Harv. *Torpoint, Falmouth, Penzance*
 — *atrorubescens*, Grev. *Mount Edgumbe, Torpoint Whitsand Bay, Looe, Fowey, Padstow, Penzance*
 var. *Agardhiana*, Grev. *Torpoint*
 — **obscura*, J. Ag. *Mount Edgumbe, Pridmouth, Penzance*
 — *fruticulosa*, Spreng. *Looe, Fowey, Padstow, Falmouth, Penzance*
 — *nigrescens*, Grev., var. *affinis*, Harv. *Cawsand*
 — **opaca*, Zan. *Falmouth*
Brongniartella byssoides, Bory. *Torpoint, Padstow, Falmouth, Penzance*
Pterosiphonia thuyoides, Schm. *Padstow, Falmouth, Penzance*
 — **complanata*, Schm. *Whitsand Bay, Padstow, Falmouth, Land's End*
 — *parasitica*, Grev. *Boscastle, Padstow, Looe, Falmouth, Penzance*
Halopithys pinastroides, Kütz. *Whitsand Bay, Falmouth*
Heterosiphonia coccinea, Falk. *Torpoint, Looe, Fowey, Falmouth*

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RHODOMELACEÆ (continued)

- Heterosiphonia coccinea*, Falk.
 var. *tenuis*, J. Ag. *Padstow, Lizard*
 var. *squarrosa*, Harv. *Whitsand Bay*
Dasya arbuscula, C. Ag. *Padstow, Falmouth, Lizard, Land's End, Scilly Isles*
 — *ocellata*, Harv. *Torpoint, Looe, Padstow, Falmouth, Penzance*

CERAMIACEÆ

- Spondylothamnion* **multifidum*, Näg. *Torpoint, Looe, Padstow, Falmouth, Penzance*
 var. *pilifera*, C. Ag. *Fowey*
Spermothamnion *Turneri*, Aresch. *Padstow, Falmouth, Lizard*
 f. *repens*, Le Jol. *Padstow*
 — *barbatum*, Born. *Penzance*
 var. *mesocarpum*, Batt. *Falmouth*
Trailliella **intricata*, Batt. *Falmouth*
Ptilothamnion **pluma*, Thur. *Looe, Pridmouth, Penzance*
Griffithsia corallina, C. Ag. *Torpoint, Falmouth, Penzance*
 — **Devoniensis*, Harv. *Torpoint, Mount Edgcumbe*
 — *setacea*, C. Ag. *Torpoint, Falmouth, Penzance*
Halurus equisetifolius, Kütz. *Padstow, Falmouth, Penzance, Land's End*
 *var *simplicifilum*, Harv. *Boscastle*
Bornetia secundiflora, Thur. *Scilly Isles*
Monospora pedicillata, Solier. *Fowey, Padstow, Falmouth, Penzance, Scilly Isles*
 f. *comosa*, Holm. & Batt. *Falmouth*
 — *clavata*, J. Ag. *Padstow, Falmouth*
Pleonosporium **Borreri*, Näg. *Torpoint, Looe, Padstow, Falmouth, Sennen Cove*
 f. *fasciculatum*, Holm. & Batt. *Padstow*
Rhodochorton *Rothii*, Näg. *Padstow, Falmouth, Penzance*
 — *floridulum*, Näg. *Padstow, Falmouth, Penzance*
Callithamnion **tenuissimum*, Kütz. *St. Germans River, Padstow, Newquay, Falmouth, Lizard, H. 54*
 — *roseum*, Harv. *Torpoint, Looe, Padstow, Falmouth, Penzance, Scilly Isles*
 — **Dudresnayi*, Crn. *Torpoint*
 — *Hookeri*, C. Ag. *Fowey, Looe, Falmouth, Penzance*
 — **Brodiaei*, Harv. *Par, Falmouth, Penzance*
 — **tetricum*, C. Ag. *Padstow, Falmouth, Lizard, Penzance, Scilly Isles*
 — *granulatum*, C. Ag. *Looe, Padstow, Pridmouth, Falmouth, Penzance, Sennen Cove, Scilly Isles*

CERAMIACEÆ (continued)

- Callithamnion byssoides*, Arn. *Torpoint, Boscastle, Falmouth, Lizard, Penzance*
 f. *seirosporifera*, Holm. & Batt. *Torpoint*
Seirospora **Griffithsiana*, Harv. *Torpoint, Whitsand Bay, Padstow*
 f. *versicolor*, Holm. & Batt. *Torpoint*
Compsothamnion **thuyoides*, Schmitz. *Mount Edgcumbe, Trebetherick, Fowey, Boscastle, Padstow, Falmouth, Land's End*
 — **gracillimum*, Schmitz. *Torpoint, Falmouth (rare)*
 — **decompositum*, Crn. *Falmouth*
Plumaria elegans, Schmitz. *Padstow, Falmouth, Penzance*
Ptilota plumosa, C. Ag. *Falmouth*
Antithamnion **cruciatum*, Näg. *Looe, Lizard*
 — *Plumula*, Thur., var. *crispa*, J. Ag. *Torpoint, Padstow, Falmouth, Penzance*
Hymenoclonium **serpens*, Batt. *Mount Edgcumbe*
Crouania **attenuata*, J. Ag. *Falmouth, Penzance, Scilly Isles*
Spyridia filamentosa, Harv. *Penzance*
Ceramium gracillimum, Harv. „
 — **fastigiatum*, Harv. *Penzance, Torpoint*
 — *tenuissimum*, J. Ag. *Pridmouth, Looe, Padstow, Penzance*
 — *Deslongchampsii*, Chauv. *Torpoint*
 — *strictum*, Harv. *Pridmouth, Padstow, Falmouth, Penzance*
 var. *delicatum*, J. Ag. *Cornwall (Batters' Catalog. p. 90)*
 — *diaphanum*, Roth. *Padstow, Falmouth, Penzance*
 — *circinnatum*, J. Ag. *Looe, Whitsand Bay, Padstow*
 — *arborescens*, J. Ag. *Mount Edgcumbe*
 — *Crouanianum*, J. Ag. *Falmouth*
 — **pennatum*, Crn. *Torpoint, Looe, Pridmouth, Constantine Bay, Falmouth*
 — *echionotum*, J. Ag. *Looe, Padstow, Falmouth, Penzance, Scilly Isles*
 — *acanthonotum*, Carm. *Padstow, Falmouth, Penzance*
 — *ciliatum*, J. Ag. *Fowey, Padstow, Penzance, Scilly Isles*
 — **flabelligerum*, J. Ag. *Padstow, Looe, Falmouth, Penzance*
Microcladia **glandulosa*, Grev. *Pridmouth, Falmouth, Penzance, Scilly Isles, H. 88*

GLÆOSIPHONIACEÆ

- Glæosiphonia* **capillaris*, Carm. *Falmouth, Lizard, Penzance*

A HISTORY OF CORNWALL

GRATELOUPIACEÆ

- Halarachnion ligulatum*, Kütz. *Torpoint*,
Whitsand Bay, Falmouth
f. *dichotomum*, Harv. *Whitsand Bay*,
Padstow
f. *ramentaceum*, Harv. *Whitsand Bay*
f. *latifolium*, Harv. *Torpoint*
Grateloupia **filicina*, C. Ag. *Whitsand*
Bay, Padstow, Falmouth, Penzance
f. *intermedia*, Holm. & Batt. *Padstow*
— **dichotoma*, J. Ag. *Fowey, Padstow*,
Newquay, Falmouth, Penzance, H. 41
— **minima*, Crn. *Falmouth*

DUMONTIACEÆ

- Dudresnaya coccinea*, Crn. *Torpoint*,
Fowey, Falmouth
Dilsea edulis, Stackh. *Bosccastle, Padstow*,
Falmouth, Lizard, Penzance

NEMASTOMACEÆ

- Schizymenia Dubyi*, J. Ag. *Mount Edg-*
cumbe, Padstow, Penzance
Nemastoma **marginifera*, J. Ag. *Whit-*
sand Bay, Padstow

SQUAMARIACEÆ

- Petrocelis cruenta*, J. Ag. *Fowey, Looe*,
Padstow, Falmouth, Penzance
Cruoria pellita, Lyngb. *Pridmouth, Pen-*
zance
Cruoriella Dubyi, Schm. *Pridmouth, Pen-*
zance
Rhodophysema **Georgii*, Batt. *Scilly Isles*
Peyssonelia Harveyana, Crn. *Penzance*
— **Rosenvingii*, Schm. *Cornwall*
(Batters' Catalog. p. 95)
— **atropurpurea*, Crn. *Penzance, Scilly*
Isles

SQUAMARIACEÆ (continued)

- Hæmatophlœa* **Crouani*, Crn. *Padstow*,
Penzance

CORALLINACEÆ

- Lithothamnion* **coralloides*, Crn. *Penzance*
— *lichenoides*, Fosl. *Looe, Fowey, Pad-*
stow, Falmouth
*f. *agariciforme*, Fosl. *Falmouth*
Epilithon membranaceum, Fosl. *Fowey*,
Penzance
Lithophyllum racemus, Fosl., *f. *crassa*,
Fosl. *Falmouth*
— *incrustans*, Phil., f. *Harveyi*, Fosl. *Fal-*
mouth, Lizard
Melobesia farinosa, Lamx. *Looe, Padstow*,
Falmouth
— *Lejolisii*, Rosan. *Falmouth, Scilly Isles*
— *Corallinæ*, Solms. *Looe, Fowey, Pad-*
stow, Lizard, H. 12
— **hapalidioides*, Fosl., f. *confinis*, Fosl.
Bosccastle, Portquin, Endellion, Fal-
mouth
Dermatolithon pustulatum, Fosl. *Fal-*
mouth, Penzance
— *macrocarpum*, Fosl., f. *Laminariæ*, Fosl.
Fowey, Padstow
Choreonema Thureti, Schm. *Lizard*
Corallina squamata, Ellis. *Fowey, Fal-*
mouth, Lizard, Penzance
— **mediterranea*, Aresch. *Fowey, Prid-*
mouth, Padstow, Falmouth, Penzance,
H. 2
— *rubens*, Ellis
var. *corniculata*, Hauck. *Looe, Fowey*,
Padstow, Falmouth, Penzance

FRESHWATER ALGÆ

Under this heading systematic algologists usually include the algæ that are not found in sea water, whether they are met with on land, or on trees, or in streams and ponds. Those which are found in brackish water are sometimes classed under freshwater algæ and sometimes under marine algæ. Unfortunately the classification and nomenclature adopted in different works vary considerably, and whilst it is necessary to keep as nearly as possible up to date so far as general classification is concerned, yet the identification of species by their synonymy is of considerable importance when consulting old records. On this account the general classification here adopted is chiefly that of Engler and Prantl, *Die Natürlichen Pflanzen-familien*, and for the specific names, De Toni's *Sylloge Algarum*, and for the Cyanophyceæ, Bornet and Flahault's *Nostocacées Hétérocystées* and Gomont's *Monographie des Oscillariées*.

In these works the synonymy is excellent, and there is no difficulty in tracing out the species in old records by means of the references therein given.

Although the freshwater algæ of the county have been investigated

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chiefly in the neighbourhood of Penzance, the work has been done by one of the keenest and most careful botanists of the last century, viz. Dr. Ralfs, whose *Monograph of the British Desmidiæ*, published in 1848, is, for lucidity of description and exquisite delineation of the forms of the species, unsurpassed even at the present day. The list of Cornish freshwater algæ is therefore, especially as far as concerns the *Desmidiaceæ*, *Diatomaceæ* (now usually called the *Bacillariaceæ*) and *Palmellaceæ*, unusually rich as regards records. During the last quarter of the century the materials collected by Dr. Ralfs were carefully collated and added to by Mr. E. D. Marquand, who published an account of the freshwater algæ of the Land's End district in the *Transactions of the Penzance Natural History and Antiquarian Society*, ii. 133, 380. Other botanists who contributed to this record were Mr. J. B. Major; Prof. O. Nordstedt of Lund University in Sweden, who paid a visit to Penzance and detected a number of new species there; Mr. A. W. Bennett, who searched the north of Cornwall, and Mr. R. V. Tellam, who collected some species in the neighbourhood of Bodmin. In the Land's End district Mr. E. D. Marquand indicates Chy-an-hal and Tremethick Moors as particularly rich in unicellular species, and the dripping rocks between Mousehole and Lamorna, and the coast between Lelant and Carbis Bay as yielding many species not observed elsewhere. The large number of species detected in this small portion of the county suggests that Cornwall is probably one of the richest counties in England in this group of plants, although it is possible that the mountainous counties near the sea, in Wales and the west of Scotland, might be richer in Alpine forms.

That the list will probably be greatly extended in the future is shown by the fact that many species new to the county, and a few new also to science, are recorded in the *Journal of Botany* for February and March, 1903.

The following are the species new to science :—

| | |
|---|---|
| Phæosphæra gelatinosa, West & G. S. West | Cosmarium quadrimammillatum, n. sp. lc. |
| Bumilleria pumila, n. sp. lc. pl. 446, figs. 22, 23 | pl. 446, fig. 12 |
| Conferva obsoleta, n. sp. lc. pl. 446, figs. 18, 21 | Debarya desmidioides, West & G. S. West, lc. pl. 446, figs. 1-9 |

The species new to the county are :—

| | |
|---|---|
| Bulbochæte subintermedia, Elfn. <i>Sennen</i> | Staurostrum granulosum, Ralfs. <i>Crowan</i> |
| Closterium pusillum, Hantsch. | — brachycerum, Bréb. <i>Sennen</i> |
| var. monolithum, With. <i>Gurnard's Head</i> | — vestitum, Ralfs. <i>St. Just</i> |
| — macilentum, Bréb. <i>Mullion</i> | Zygnema Vaucherii, C. Ag., var. stagnale, Kirchn. <i>Lizard</i> |
| — pronum, Bréb. " | Conferva affinis, Kütz. <i>South of Helston, St. Mary's, Scilly</i> |
| Euastrium lobulatum, Bréb. <i>Tremethick Moor, St. Just, Sennen, Land's End</i> | Characiopsis minuta, Borzi. <i>Penzance</i> |
| Genicularia spirotænia, De Bary. <i>Hayle</i> | Centrosphæra Fasciolæ, Borzi. <i>Sennen</i> |
| Cosmarium Lundellii, Delp. <i>Mousehole</i> | Bulbochæte subintermedia, Kütz. " |
| — abbreviatum, Racib. <i>Crowan</i> | Euastropsis Richteri, Lagerh. " |
| — commissurale, Bréb. <i>St. Just</i> | |

A HISTORY OF CORNWALL

CYANOPHYCEÆ

Gongrosira viridis, Kütz. *Tremethick*
Hapalosiphon Hibernicus, West & G. S.
 West. *Sennen*

RHODOPHYCEÆ

Chantransia Scotica, Kütz. *Mousehole*
Sacheria mammosa, Sirod. *Penzance*

In Mr. Marquand's list no definite localities are given, and where records are not obtainable elsewhere, W.C. indicates that his list is the authority for their record in this part of the county. The species recorded by him as rare are indicated by an asterisk. E.C. and N.C. indicate East and North Cornwall respectively.

Schizothrix Cresswellii is only found elsewhere at Sidmouth in Devon. *Cosmarium commisurale* is found nowhere else in the British Islands so abundantly as in Cornwall, and *C. quadrimammillatum* has not been observed elsewhere in Britain. The genus *Centrosphaera* is new to Britain, and *Euastropsis Richteri* has previously only been found in Germany and Norway; *Mougeotia gelatinosa*, elsewhere in Wales and Scotland, in one locality in each; *Genicularia Spirotænia* is the rarest of all desmids; *Gongrosira viridis* is known only elsewhere in the British Isles from Lough Beg, Londonderry.

CYANOPHYCEÆ

CHROOCOCCACEÆ

Chroococcus turgidus, Näg. *W.C.*
*Glæocapsa *coracina*, Kütz. *Carbis Bay*
 — *livida*, Carm. *Carbis Bay*
 — *quaternata*, Kütz. " "
Aphanocapsa virescens, Rab. *Carbis Bay*
Aphanothece microscopica, Näg. " "
Microcystis marginata, Kirchn. " "
Cœlosphaerium Kutzingianum, Näg. *Carbis Bay*
Merismopedium glaucum, Näg. *Carbis Bay*

OSCILLATORIACEÆ

*Schizothrix *Cresswellii*, Harv. *Mousehole*
 — **rubra*, Menegh. *Mousehole*
 — **tinctoria*, Gom. *Newbridge near Penzance*
Microcoleus vaginatus, Gom. *W.C.*
Plectonema Tomasinianum, Born. "
Symploca muscorum, Gom. "
Lyngbya ochracea, Thur. "
Phormidium autumnale, Gom. "
 — *inundatum*, Kütz. *W.C.*
 — *papyrinum*, Bory. "
Oscillatoria amphibia, C. Ag. *W.C.*
 — *limosa*, C. Ag. *W.C.*
 — *nigra*, Vauch. "
 — *princeps*, Vauch. "
 — *splendida*, Grev. "
 — *subfusca*, Vauch. inq. *W.C.*
 — *tenuis*, C. Ag. *W.C.*
Beggiatoa leptomitiformis, Trevis. (?) *W.C.*
*Spirulina *oscillarioides*, Turp. inq. "

RIVULARIACEÆ

*Isactis *plana*, Harv. *Mousehole*
Rivularia dura, Kütz. *W.C.*
 — **granulifera*, Carm. *Carbis Bay*
Glæotrichia Pisum, Thur. *W.C.*

SIROSIPHONACEÆ

Gongrosira viridis, Kütz. *Tremethick*
 **Hapalosiphon Hibernicus*, West & G. S.
 West. *Sennen*
Stigonema minutum, Hass. *W.C.*
 — *ocellatum*, Thur. *W.C.*
 — *panniforme*, Gom. "

SCYTONEMACEÆ

Scytonema Hoffmanni, C. Ag. *W.C.*
 — *Myochrous*, C. Ag. *W.C.*
Tolypothrix lanata, Wartm. *W.C.*

NOSTOCACEÆ

*Nostoc *cæruleum*, Lyngb. *Chy-an-bal Moor*
 — *microscopicum*, Carm. *W.C.*
 — *muscorum*, C. Ag. "
 — *verrucosum*, Vauch. "
Anabæna catenula, Born. & Flah. *W.C.*
 — *Flos-aquæ*, Bréb. *W.C.*
 — *oscillarioides*, Bory. *Chy-an-bal Moor*
 — *torulosa*, Lagerh. " "
 — *variabilis*, Kütz. *Hayle*
Cylindrospermum stagnale, Born. & Flah. *W.C.*

BACILLARIACEÆ (*Diatoms*)

NAVICULACEÆ

Navicula æstiva, Donk. *W.C.*
 — *amphisbæna*, Bory. "
 — *aspera*, Ehr. "
 — *bacillum*, Ehr. "
 — *biceps*, Ehr. "
 — *borealis*, Kütz. "
 — *cancellata*, Donk. "
 — *Cluthensis*, Greg. "
 — *crabro*, Kütz. "
 var. *pandura*, Rabenh. "
 — *cruciformis*, Donk. "

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NAVICULACEÆ (continued)

- Navicula cuspidata*, Kütz. *W.C.*
 — *dicephala*, Ehr. "
 — *didyma*, Ehr. "
 — *firma*, Kütz. "
 — *forcipata*, Cnw. "
 — *gregaria*, Donk. "
 — *Hennedyi*, W. Sm. "
 var. *clavata*, V. H. "
 — *humerosa*, Bréb. "
 — *Iridis* var. *affinis*, V.H. "
 — *lineata*, Donk. "
 — *lyra*, Ehr. "
 — *maxima*, Greg. "
 — *musca*, Greg. "
 — *parvula*, Eweg. "
 — *placentula*, Kütz. "
 var. *anglica*, Grun. "
 — *prætexta*, Ehr. "
 — *pygmata*, Kütz. "
 — *rhyncocephala*, Kütz. *Penzance*
 — *serians*, Kütz. *W.C.*
 — *Smithii*, Bréb. "
 — *sphærophora*, Kütz. *W.C.*
 — *stauoptera*, Grun. *Rough Tor*
Libellus rhombicus, De Toni. *W.C.*
 — *Grevillei*, Cleve. "
Okedenia inflexa, Eulenst. "
Pleurosigma acuminatum, Grun. "
 — *angulatum*, W. Sm. "
 var. *æstuarii*, Bréb. "
 var. *elongatum*, V.H. "
 var. *quadratum*, W. Sm. "
 — *arcuatum*, Donk. *Padstow*
 — *Balticum*, W. Sm. *W.C.*
 — *decorum*, W. Sm. "
 — *distortum*, W. Sm. "
 — *formosum*, W. Sm. "
 — *Hippocampus*, W. Sm. "
 — *intermedium*, W. Sm. "
 — *lanceolatum*, Donk. *Padstow*
 — *marinum*, Donk. "
 — *rigidum*, W. Sm. *W.C.*
 — *Spencerii*, W. Sm. "
Scoliopleura latestriata, Grun. "
 — *tumida*, Rabenh. "
 — *Westii*, Grun. "
Rhoicosigma compactum, Grun. "
Toxonidea Gregoriana, Donk. *Padstow*
 — *insignis*, Donk. "
Frustulia Lewisiana, De Toni. "
 — *neglecta*, De Toni. "
 — *rhomboides*, De Toni. *W.C.*
 var. *Saxonica*, De Toni. "
Schizonema Dillwynii, C. Ag. "
 — *ramosissima*, C. Ag. "
 — *Smithii*, C. Ag. "
Berkeleya fragilis, Grev. "
 — *obtusa*, Grun. "
 — *parasitica*, Grun. "

AMPHITROPIDACEÆ

- Amphiprora alata*, Ehr.
 — *gigantea*, Grun. *Penzance*
 — *lepidoptera*, Greg. *Padstow*
 — *maxima*, Greg. *W.C.*
Plagiotropis vitrea, Grun. "

CYMBELLACEÆ

- Cymbella æqualis*, W. Sm. *Rough Tor*
 — *affinis*, Kütz. *W.C.*
 — *Cistula*, Kirchn. "
 var. *maculata*, Grun. "
 — *cuspidata*, Kütz. *Rough Tor*
 — *cymbiformis*, Bréb. *W.C.*
 — *lanceolata*, Kirchn. "
Encyonema cæspitosum, Kütz. "
 — *prostratum*, Ralfs. "
Amphora arenaria, Donk. "
 — *decipiens*, Grun. *Hayle*
 — *Erebi*, Ehr. "
 — *levissima*, Greg. *Penzance*
 — *marina*, W. Sm.
 — *membranacea*, W. Sm. *W.C.*
 — *ovalis*, Kütz. "
 var. *pediculus*, V.H. *Sennen*
 — *proteus*, Greg. "
 — *salina*, W. Sm. "

GOMPHONEMACEÆ

- Gomphonema acuminatum*, Ehr. *Sennen*
 — *constrictum*, Ehr. "
 — *dichotomum*, Kütz. *Penzance*
 — *insigne*, Greg. *W.C.*
 — *olivaceum*, Kütz. "
 — *parvulum*, Kütz. "
Rhoicosphenia curvata, Grun. "

COCCONEIDACEÆ

- Cocconeis diaphana*, W. Sm. "
 — *dirupta*, Grev. "
 — *placentula*, Ehr. "
 — *scutellum*, Ehr. "

ACHNANTHACEÆ

- Achnanthes brevipes*, C. Ag. "
 — *coarctata*, Grun. "
 — *exilis*, Kütz. "
 — *longipes*, C. Ag. "
 — *minutissima*, Kütz. "
 — *subsessilis*, Kütz. "

NITZSCHACEÆ

- Nitzschia acicularis*, W. Sm. "
 — *acuminata*, Grun. "
 — *angularis*, W. Sm. "
 — *angustata*, Grun. *Padstow*
 — *apiculata*, Grun. "
 — *Brebbissonii*, W. Sm. "
 — *circumsuta*, Grun. "
 — *epithemoides*, Grun. *Penzance*
 — *lanceolata*, W. Sm. *W.C.*
 f. *minor*, V.H. *Padstow*
 — *linearis*, W. Sm. *W.C.*
 — *macilenta*, Greg. "
 — *navicularis*, Grun. "

A HISTORY OF CORNWALL

NITZSCHIACEÆ (continued)

| | |
|-----------------------------|---------|
| Nitzschia palea, W. Sm. | W.C. |
| — plana, W. Sm. | " |
| — rostrata, Grun. | " |
| — Sigma, W. Sm. | " |
| var. curvula, Brun. | " |
| — Smithii, Ralfs. | " |
| — spathulata, Bréb. | " |
| — vivax, W. Sm. | " |
| Hantzschia amphioxys, Grun. | W.C. |
| — virgata, Grun. | Padstow |
| — marina, Grun. | " |

SURIRELLACEÆ

| | |
|--------------------------------|--------|
| Suriraya biseriata, Bréb. | W.C. |
| — elegans, Ehr. | " |
| — fastuosa, Ehr. | " |
| var. lata, V.H. | " |
| — gemma, Ehr. | " |
| — linearis, W. Sm. | " |
| — Moëlleriana, Grun. | Sennen |
| — ovalis, Bréb. | W.C. |
| var. angusta, V.H. | " |
| var. Crumena, V.H. | " |
| var. minuta, V.H. | " |
| var. ovata, V.H. | " |
| var. pinnata, V.H. | " |
| var. salina, V.H. | " |
| — robusta, Ehr. | " |
| — Smithii, Ralfs. | " |
| — spiralis, Kütz. | " |
| — splendida, Kütz. | " |
| Cymatopleura solea, W. Sm. | " |
| Campylodiscus parvulus, W. Sm. | " |
| — Ralfsii, W. Sm. | " |
| var. pinnatus, Perag. | " |
| — Thuretii, Bréb. | " |

DIATOMACEÆ

| | |
|---------------------------|----------|
| Diatoma elongatum, C. Ag. | " |
| var. tenue, C. Ag. | " |
| — hiemale, Heib. | " |
| var. mesodon, Grun. | " |
| — obtusum, Kirchn. | " |
| Odontidium marinum, Grun. | Penzance |

MERIDIONACEÆ

| | |
|------------------------------|------|
| Meridion constrictum, Ralfs. | W.C. |
|------------------------------|------|

FRAGILARIACEÆ

| | |
|-------------------------------|----------|
| Synedra affinis, Kütz. | " |
| var. tabulata, V.H. | " |
| — Gallionii, Kütz. | " |
| — pulchella, Kütz. | Penzance |
| — Ulna, Ehr. | W.C. |
| var. splendens, Brun. | " |
| — Vaucheriae, Kütz. | " |
| Ardissonia crystallina, Grun. | " |
| — superba, Grun. | " |
| Toxarium Henedyanum, Grun. | " |
| — undulatum, Bail. | " |
| Fragilaria capucina, Desmaz. | " |
| — hyalina, Grun. | " |
| var. minima, De Toni. | " |

FRAGILARIACEÆ (continued)

| | |
|-------------------------------|---------|
| Fragilaria virescens, Ralfs. | W.C. |
| Grammonema striatulum, C. Ag. | " |
| Rhaphoneis amphiceros, Ehr. | " |
| Dimerogramma fulvum, Ralfs. | Padstow |

LICMOPHORACEÆ

| | |
|-------------------------------|----------|
| Licmophora flabellata, C. Ag. | W.C. |
| — Lyngbyei, Grun. | " |
| — ovata, Grun. | " |
| — paradoxa, C. Ag. | Penzance |

STRIATELLACEÆ

| | |
|--------------------------------|------|
| Tabellaria fenestrata, Kütz. | W.C. |
| — flocculosa, Kütz. | " |
| Grammatophora angulosa, Ehr. | " |
| var. hamulifera, Grun. | " |
| — marina, Lyngb. | " |
| — oceanica, Ehr. | " |
| var. macilenta, Grun. | " |
| — serpentina, Ralfs. | " |
| Rhabdonema Adriaticum, Kütz. | " |
| — arcuatum, Kütz. | " |
| — minutum, Kütz. | " |
| Striatella unipunctata, C. Ag. | " |

EUNOTIACEÆ

| | |
|-----------------------------|---|
| Cystopleura argus, Kunze. | " |
| var. longicornis, Grun. | " |
| — gibberula, Kunze. | " |
| var. rupestris, Grun. | " |
| — ocellata, Bréb. | " |
| — turgida, Kunze. | " |
| var. Westermannii, Grun. | " |
| Eunotia alpina, Kütz. | " |
| — arcus, Ehr. | " |
| — diodon, Ehr. | " |
| — gracilis, Rabenh. | " |
| — major, Rabenh. | " |
| — pectinalis, Rabenh. | " |
| — robusta, Ralfs. | " |
| — Soleirolii, Rabenh. | " |
| — tetraodon, Ehr. | " |
| Pseudoeunotia biceps, Grun. | " |
| — flexuosa, Grun. | " |
| — lunaris, Grun. | " |
| var. bilunaris, Grun. | " |

RHIZOLENIACACEÆ

| | |
|------------------------------------|------|
| Rhizosolenia styliformis, Brightw. | W.C. |
|------------------------------------|------|

ISTHMIACEÆ

| | |
|----------------------------|---|
| Isthmiella enervis, Cleve. | " |
|----------------------------|---|

BIDDULPHIACEÆ

| | |
|-------------------------------|---|
| Biddulphia pulchella, Gray. | " |
| Denticella Mobiliensis, Grun. | " |
| Amphitetras alternans, Bréb. | " |
| — antediluviana, Ehr. | " |
| Triceratium pileus, Ehr. | " |

CHÆTOCERACEÆ

| | |
|---------------------------|---|
| Chætoceros armatus, West. | " |
| — confervoides, Ralfs. | " |
| — didymus, Ehr. | " |
| — incurvus, Bail. | " |
| Syndendrium Diadema, Ehr. | " |

BOTANY

EUPODISCACEÆ

Auliscus sculptus, Ralfs. *W.C.*

COSCINODISCACEÆ

Actinocyclus Ralfsii, Ralfs. *W.C.*

— *sparsus*, Rattr. "

— *subtilis*, Ralfs. "

Brightivellia splendida, Rattr. "

Coscinodiscus excentricus, Ehr. "

— *lineatus*, Ehr. "

— *radiatus*, Ehr. "

MELOSIRACEÆ

Lysigenium varians, De Toni. "

Gallionella nummuloides, Bory. "

Melosira Dickiei, Kütz. "

— *ochracea*, Ralfs. "

— *orichalcea*, Kütz. "

— *Roeseana*, Rab. "

var. *dendroteres*, Grun. "

Paralia sulcata, Cleve. "

Podosira Montagnei, Kütz. "

Hyalodiscus stelliger, Bail. "

HELIOPELTACEÆ

Actinoptychus splendens, Shadb. "

— *undulatus*, Ralfs. "

CHLOROPHYCEÆ

DESMIDIACEÆ

Desmidium cylindricum, Grev. *W.C.*

— *Swartzii*, C. Ag. "

— **quadrangulare*, Kütz. *Penzance*

Hyalotheca dissiliens, Bréb. "

— *mucosa*, Ehr. *W.C.*

Sphærozozoma excavatum, Ralfs. *W.C.*

— **vertebratum*, Ralfs. "

Onychonema filiforme, Roy & Biss. *Cyan-hal*

Gymnozyga moniliformis, Ehr. *W.C.*

Gonatozygon asperum, Cleve. *Kerris Moor*

— *Ralfsii*, De Bary. *W.C.*

Cosmocladium constrictum, Josh. *Treng-wainton*

Genicularia Spirotænia, De Bary. *Hayle*

Spirotænia condensata, Bréb. *Penzance*

— *minuta*, Thur. *W.C.*

— *obscura*, Ralfs. *Penzance*

Mesotænium Braunii, De Bary

— *parvula*, Arch. *W.C.*

Cylindrocystis Brébissonii, Menegh. *Bod-min*

— *diplospora*, Lund. *W.C.*

Closterium acerosum, Ehr. *W.C.*

— *acutum*, Bréb. *Bodmin, Penzance*

— *angustatum*, Kütz. *W.C.*

— *attenuatum*, Ehr. *Penzance*

— *cornu*, Ehr. *W.C.*

— *costatum*, Corda. "

— *Cynthia*, De Not. "

— *Dianæ*, Ehr. "

— *didymotocum*, Corda. "

DESMIDIACEÆ (continued)

Closterium Ehrenbergii, Menegh. *W.C.*

— *gracile*, Bréb. *W.C.*

— *incurvum*, Bréb. "

— **intermedium*, Ralfs. "

— *Jenneri*, Ralfs. "

— *juncidium*, Ralfs. "

— *Leibleinii*, Kütz. "

— *linea*, Pert. "

— *lineatum*, Ehr. *Rough Tor, Penzance*

— *macilentum*, Bréb. *Mullion*

— *lunula*, Nitsch. *W.C.*

— *moniliferum*, Ehr. "

— *parvulum*, Näg. *Bodmin*

— *prorum*, Bréb. *Mullion*

— *pusillum*, Hantzsch. *Penzance*

var. *monolithum*, Wittr. *Gurnard's*

Head

— *rostratum*, Ehr. *Penzance*

— *setaceum*, Ehr. *W.C.*

— *striolatum*, Ehr. "

— *turgidum*, Ehr. *Penzance*

— *Venus*, Kütz. *W.C.*

Penium closterioides, Ralfs. "

— *didymocarpum*, Lund. "

— *digitus*, Bréb. "

— *interruptum*, Bréb. "

— *lamellosum*, Bréb. "

— *margaritaceum*, Bréb. *Penzance*

— *navicula*, Bréb. "

— *oblongum*, De Bary. "

— **truncatum*, Ralfs. *W.C.*

Tetmemorus Brébissonii, Ralfs. "

— *granulatus*, Ralfs. "

— *lævis*, Ralfs. "

— **penioides*, Benn. *Mawgan*

Docidium baculum, Bréb. *W.C.*

— **granulatum*, Benn. *Mawgan*

— *minutum*, Ralfs. *W.C.*

— *siculum*. *Bodmin*

Disphyncium annulatum, Näg. *W.C.*

— *cucurbita*, Reinsch. "

— **curtum*, Bréb. "

— *cylindrus*, Näg. "

— *quadratum*, Hansg. "

— *sinuosum*, Hansg. "

var. *decedens*, Reinsch. *Penzance*

Pleurotænium clavatum, De Bary. *W.C.*

— *Ehrenbergii*, Delponte. "

— *nodulosum*, De Bary. *Penzance*

— *truncatum*, Näg. *W.C.*

Pleurotæniopsis aculeatum, Ehr. "

— *Ralfsii*, Lund. "

Xanthidium armatum, Bréb. "

— *Brébissonii*, Ralfs. "

— *cristatum*, Bréb. "

— *fasciculatum*, Ehr. "

Cosmarium abbreviatum, Racib. *Crowan*

— *amænum*, Bréb. *W.C.*

— *ansatum*, Kütz. "

A HISTORY OF CORNWALL

DESMIDIACEÆ (continued)

- Cosmarium bioculatum*, Bréb. *W.C.*
 — *Boeckii*, Will. *Bodmin*
 — *Botrytis*, Menegh. *Penzance*
 — *Brébissonii*, Menegh. "
 — **Broomei*, Thw. *N.C.*
 — *cælatum*, Ralfs. *Bodmin, Rough Tor*
 — **commissurale*, Bréb. *St. Just*
 — *crenatum*, Ralfs. *W.C.*
 var. subcrenatum, Rab. "
 — *cristatum*, Ralfs. *N.C.*
 — *cylindricum*, Ralfs. *W.C.*
 — *discretum*, Benn. *Roche, St. Dennis*
 — *erosum*, Delp. *Penzance*
 — *galeritum*, Nordst. *W.C.*
 — **granatum*, Bréb. "
 — *Hammeri*, Reinsch. "
 — *læve*, Rab. "
 — **Lundellii*, Delph. *Mousehole*
 — *margaritifera*, Menegh. *W.C.*
 — *melanospermum*, Arch. *Bodmin*
 — *Meneghinii*, Bréb., *var. angulosum*,
 Rab. *Penzance*
 — **moniliforme*, Ralfs. *Penzance*
 — *orbiculatum*, Ralfs. "
 — *ornatum*, Ralfs. "
 — **Phaseolus*, Bréb. *W.C.*
 — *Portianum*, Arch. "
 — *pseudopyramidatum*, Lund. *W.C.*
 var. stenonotum, Raddi. *Penzance*
 — *pyramidatum*, Bréb. "
 — **quadriramillatum*, West & G. S.
 West. *Lizard*
 — *Regnesii*, Reinsch. *Penzance*
 — *rectangulare*, Grun. *Bodmin*
 — *reniforme*, Arch. *W.C.*
 — *speciosum*, Lund. *N.C.*
 — *sphæricum*, Benn. "
 — *tetraophthalmus*, Bréb. "
 — **tinctum*, Ralfs. "
 — *undulatum*, Corda. "
 — *Wittrockii*, Lund. "
Arthrodesmus convergens, Ehr. "
 — *incus*, Hass. "
 — *octocornis*, Ehr. "
Euastrum affine, Ralfs. *W.C.*
 — *binale*, Ralfs. "
 — *crassum*, Kütz. "
 var. Cornubiense, Benn. *St. Dennis*
 — *crenulatum*, Benn. *N.C.*
 — *didelta*, Ralfs. *W.C.*
 — *elegans*, Kütz. "
 — *erosum*, Lund. *N.C.*
 — *gemmatum*, Bréb. "
 — *insigne*, Hass. *Lizard, Penzance*
 — *insulare*, Wittr. *N.C.*
 — *oblongum*, Ralfs., *var. Cornubiense*,
 Benn. *Mawgan, W.C.*
 — *pectinatum*, Bréb. *Penzance*
 — *pulchellum*, Bréb. "

DESMIDIACEÆ (continued)

- Euastrum *rostratum*, Ralfs. *W.C.*
 — *verrucosum*, Ehr. "
**Euastropsis Richteri*, Lagerh. *Sennen* ;
 previously found only in Norway
 and Germany
Micrasterias denticulata, Ralfs. *W.C.*
 — *Jenneri*, Ralfs. "
 — *mucronata*, Rab. *Penzance*
 — *papillifera*, Bréb. *W.C.*
 — *radiosa*, C. Ag. "
 — *rotata*, Ralfs. "
 — *truncata*, Bréb. "
Staurostrum apiculatum, Bréb. *Penzance*
 — *alternans*, Bréb. "
 — **asperum*, Bréb. "
 — **avicula*, Bréb. "
 — *bifidum*, Bréb. *W.C.*
 — *brachiatum*, Ralfs. "
 — *brachycerum*, Bréb. *Sennen*
 — *brevispina*, Bréb. *W.C.*
 — *controversum*, Bréb. "
 — *cristatum*, Arch. "
 — **Cornubiense*, Benn. *Roche*
 — **cuspidatum*, Bréb. *Penzance*
 — *cyrtocerum*, Bréb. *W.C.*
 — *dejectum*, Bréb. "
 — **Dickiei*, Ralfs. *Penzance*
 — *dilatatum*, Ehr. *W.C.*
 — *dispar*, Bréb. "
 — *furcatum*, Ehr. *Penzance*
 — *furcigerum*, Bréb. *W.C.*
 — *glabrum*, Ralfs. "
 — *gracile*, Ralfs. "
 — *granulosum*, Ralfs. *Crowan*
 — *hirsutum*, Bréb. *W.C.*
 — *inconspicuum*, Nordst. "
 — **lunatum*, Ralfs. "
 — *margaritaceum*, Menegh. *Penzance*
 — **monticulosum*, Bieb. *W.C.*
 — *mucronatum*. *Penzance*
 — **muricatum*, Bréb. *W.C.*
 — **muticum*, Bréb. "
 — *orbiculare*, Ralfs. "
 — *paradoxum*, Meyen. "
 — *pilosum*, Arch. *Rough Tor*
 — *polymorphum*, Bréb. *W.C.*
 — *polytrichum*, Perty. "
 — *pterosporum*, Lund. *Penzance*
 — **punctulatum*, Bréb. *W.C.*
 — **pungens*, Bréb. "
 — *pygmæum*, Bréb. *Penzance*
 — **sexcostatum*, Bréb. *W.C.*
 — *spinosum*, Bréb. "
 — **spongiosum*, Bréb. "
 — *teliferum*, Ralfs. "
 — *tetracerum*, Ralfs. "
 — *tumidum*, Bréb. "
 — *vestitum*, Ralfs. *St. Just*

BOTANY

MOUGEOTIACEÆ

- De Barya desmidioides, West & G. S. West. *Lizard*
 Mougeotia capucina, C. Ag. *Tremethick Moor*
 — depressa, Wittr. *W.C.*
 — gelatinosa, Wittr. *Lizard*
 — genuflexa, C. Ag. "
 — gracillima, Wittr. "
 — ovalis, Nordst. "
 — parvula, Hass. "
 var. angusta, Kirchn. "
 — punctata, Wittr. "
 — recurva, De Toni. "
 — scalaris, Hass. "
 — viridis, Wittr. "
 Spirogyra arcta, Kütz. "
 var. catenæformis, Kirchn. *Lizard*
 — inflata, Rab. *Lizard, Kerris Moor*
 — longata, Kütz. *Kerris Moor*
 — maxima, Wittr. "
 — nitida, Link. "
 — porticalis, Cleve. "
 — stictica, Will. "
 — tenuissima, Kütz. "
 Zygnema cruciatum, C. Ag. "
 — ericetorum, Hansg. "
 — pectinatum, C. Ag. "
 var. anomalum, Kirchn. "
 — peliosporum, De Bary. *Chy-an-bal Moor*
 — Ralfsii Wittr. *Chy-an-bal Moor*
 — stellinum, C. Ag. *W.C.*
 var. stagnale, Kirchn. *Lizard*
 var. Vaucherii, Kirchn. *W.C.*

VOLVOACEÆ

- Eudorina elegans, Ehr. *Sancreed*
 Gonium pectorale, Muell. "
 Pandorina morum, Bory. "
 — aureus, Ehr. *Trungle Moor*
 Volvox globator, Ehr. *Kennall Valley, Trungle Moor, etc.*

PALMELLACEÆ

- Apiocystis Brauniana, Näg. *W.C.*
 Botryococcus Braunii, Kütz. "
 Characium heteromorphum, Reinsch. "
 — Hookeri, Hansg. "
 — longipes, Rab. "
 — ornithocephalum, A. Br. "
 — Sieboldi, A. Br. "
 Characiopsis minuta, Borzi. *Penzance*
 Cœlastrum cubicum, Näg. "
 — sphaericum, Näg. *Boscastle*
 Dictyosphaerium Ehrenbergianum, Näg. *N.C.*
 Eremosphaeria viridis, De Bary. *N.C.*
 Centrosphaera facciolæ, Borzi. *Sennen*
 Gloeocystis gigas, Lagerh. *W.C.*
 — rupestris, Rab. "

PALMELLACEÆ (continued)

- Gloeocystis versicolor, Näg. *W.C.*
 Nephrocystium Agardhianum, Näg. "
 Ophiocystium cochleare, A. Br. "
 Palmodactylon simplex, Näg. "
 — subramosum, Näg. "
 Pediatrum biradiatum, Meyen. "
 — Boryanum, Menegh. "
 — constrictum, Hass. "
 — Ehrenbergii, A. Br. "
 — integrum, Näg. *Tintagel*
 — tetras, Ralfs. *W.C.*
 Pleurococcus vulgaris, Menegh. "
 Protococcus frustulosus, De Toni. *Boscastle*
 Raphidium polymorphum, Fresen. *W.C.*
 var. aciculare, Rab. "
 var. falcatum, Rabenh. "
 Scenedesmus bijugatus, Kütz., var. alternans, Hansg. *Chy-an-bal and Tremethick Moors*
 — obliquus, Kütz. *Chy-an-bal*
 var. dimorphus, Rabenh. "
 — quadricauda, Bréb. "
 Schizochlamys *gelatinosa, A. Br. *Penzance*
 Sciadium *arbuscula, A. Br. *Chy-an-bal Moor*
 Selenastrum Bibrayanum, Reinsch. *Chy-an-bal Moor*
 — bifidum, Benn. *Chy-an-bal Moor*
 Sorastrum bidentatum, Reinsch. *Mawgan*
 — spinulosum, Näg. "
 Staurogenia rectangularis, A. Br. "
 Tetradron enorme, Hansg. "
 — regulare, Kütz. "
 Tetraspora gelatinosa, Desv. "
 — lubrica, C. Ag. "
 Urococcus insignis, Hass. "

ULVACEÆ

- Prasiola calophylla, Menegh. *Mawgan*
 — crispa, C. Ag. "
 — furfuracea, Menegh. "

ULOTHRIXACEÆ

- Bumilleria pumila, West & G. S. West. *Sennen*
 Hormidium murale, Kütz. *Sennen*
 Hormiscia æqualis, Kütz. *W.C.*
 — moniliformis, Rab. "
 — zonata, Aresch. "
 var. catenæformis, Rab. "
 Hormospora mutabilis, Näg. "
 Microspora fugacissima, Rab. "
 — vulgaris, Rab. "

CONFERVACEÆ

- Conferva affinis, Kütz. *Helston; St. Mary's, Scilly Isles*
 — obsoleta, West & G. S. West. *Penzance; St. Mary's, Scilly Isles*

A HISTORY OF CORNWALL

CHÆTOPHORACEÆ

- Aphanochæte globosa, Wolle. *Land's End*
 — repens, Berth. *Kerris and Chy-an-bal Moors*
 Chætophora endiviæfolia, C. Ag. *W.C.*
 — pisiformis, C. Ag. "
 — tuberculosa, W. Hook. "
 Draparnaldia glomerata, C. Ag. *Bodmin*
 Stigeoclonium fastigiatum, Kütz. *Chy-an-bal and Trungle Moors*
 — protensum, Kütz. *W.C.*
 — tenue, Rab. "
 — thermale, A. Br. "

CHROOLEPIDACEÆ

- Microthamnion vexator, Cooke. *W.C.*
 Trentepohlia aurea, Mart. "
 — umbrina, Born. "

ÆDOGONIACEÆ

- Bulbochæte crassiuscula, Nordst. "
 — mirabilis, Wittr. "
 — polyandra, Cleve. "
 — pygmæa, Wittr. *Chy-an-bal and Ker-ris Moors*
 — rectangularis, Wittr. *Near Grumbler*
 — sessilis, Wittr. *Bodmin*
 — setigera, C. Ag. *W.C.*
 — subintermedia, Elfv. *Sennen*
 — subsimplex, Wittr. *W.C.*
 Ædogonium Areschougii, Wittr. *W.C.*
 — Borisianum, Wittr. *St. Mary's, Scilly Isles*
 — Boschii, Wittr. *W.C.*
 — Braunii, Roth. *Lizard*
 — capitellatum, Wittr. *W.C.*
 — cardiceum, Kütz. "
 — ciliatum, Pringsh. "
 — Cleveanum, Wittr. "
 — crispum, Wittr. "
 — cyathigerum, Wittr. "
 — decipiens, Wittr. *Sennen*
 — echinospermum, A. Br. *W.C.*
 — flavescens, Kütz. "
 — inerme, Hirn. *St. Mary's, Scilly Isles*
 — Landsboroughii, Wittr. *W.C.*
 — macrandrum, Wittr. "
 — oblongum, Wittr. "
 — platygynum, Wittr. "
 — psægmatosporum, Nordst. "

ÆDOGONIACEÆ (continued)

- Ædogonium Rothii, Pringsh. *W.C.*
 — rufescens, Wittr. *St. Mary's, Scilly Isles*
 — sphærandrum, Wittr. *W.C.*
 — Vaucherii, A. Br. "

COLEOCHÆTACEÆ

- Coleochæte scutata, Bréb. "

CLADOPHORACEÆ

- Cladophora canicularis, Kütz. *W.C.*

BOTRYDIACEÆ

- Botrydium granulatum, Grev. *Marazion Marsh (August)*

VAUCHERIAACEÆ

- Vaucheria dichotoma, C. Ag. *W.C.*
 — Dillwynii, C. Ag. *W.C.*
 — geminata, D.C. "
 — sessilis, D.C. "
 — terrestris, Lyngb. "

RHODOPHYCEÆ

BANGIACEÆ

- Porphyridium cruentum, Näg. *W.C.*

LEMANIACEÆ

- Lemania fluviatilis, C. Ag. "
 Sacheria mammosa, Sirod. *Penzance*

HELMINTHOCLADIACEÆ

- Batrachospermum *Dillenii, Bory. *Penzance, Bodmin*
 — moniliforme, Roth. *Bodmin, Ponsanooth*
 — *pygmæum, Sirod. *W.C.*
 — *vagum, C. Ag. "
 Balbiania *investiens, Sirod. *Penzance*
 Chantransia Hermannii, Desv. *W.C.*
 — chalybea, Kütz. "
 — compacta, Ralfs. "
 — pygmæa, Kütz. *Mawgan*
 — Scotica, Kütz. *Mousehole*

HILDENBRANDTIACEÆ

- Hildenbrandtia *rivularis, J. Ag. *St. Knighton's Kieve, Bodmin*

PHÆOPHYCEÆ

PHÆOCAPSACEÆ

- Phæosphæra *gelatinosa, West & G. S. *West. Tremethick Moor*

LICHENS (*Lichenes*)

Few English counties can boast of so rich a lichen flora as Cornwall, and few have been worked by so many good lichenologists. Half a century ago the Rev. T. Salwey and the Rev. F. Pentreath published a list of Cornish lichens in the second volume of the *Transactions of the Penzance Natural History and Antiquarian Society*. The celebrated botanist Mr. W. Borrer frequently joined Dr. Ralfs and the Rev. T. Salwey in rambles after rare species. In 1880 a more complete list of the lichens

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of West Cornwall was published in vol. i. new ser. of the same work (pp. 215, 422) by Dr. Ralfs. In 1884 (loc. cit. ii. 73, 379) Mr. R. V. Tellam published a very full list of the lichens of the eastern part of the county. *The List of Scale Mosses and Lichens of Devon and Cornwall*, published at Plymouth in 1872 by Mr. E. M. Holmes, also contains a number of Cornish localities for lichens. Other lichenologists who have explored various parts of the county are the late Mr. Dawson Turner, Dr. H. B. Holl, Mr. E. G. Varenne, Mr. E. D. Marquand, the Rev. J. M. Crombie, and others. The largest contributors to the Cornish lists have undoubtedly been the Rev. T. Salwey, Dr. Ralfs, Mr. W. Curnow, and Mr. R. V. Tellam. Mr. Holmes has visited in search of lichens the boundary line of the Tamar from Mount Edgcumbe to Saltash, Whitsand Bay, Fowey, Padstow, St. Ives, Newquay, Bedruthan, Falmouth, Lizard, Penzance and Land's End. Lichens from these localities that do not appear in the published lists are mostly records taken from specimens in his herbarium.

The characteristic lichens of the county are chiefly those that occur on maritime rocks, especially on granite, clay, slate, and serpentine. Those characteristic of hard limestone, and of mountainous or subalpine regions, are fewer in comparison, although there are many cretaceous species found on the shelly sand dunes, as at St. Minver, and on the mortar of old walls. The abundant oak coppices, clothing the sides of damp ravines, as in the neighbourhood of Bodmin, furnish many southern species; others are found in the warm climate of Scilly Isles, Penzance, and the Lizard that are not found further north, or very sparingly so on the north-west of Great Britain, where the influence of the Gulf Stream is felt. Thus *Lecidea Muddii* is found on the coast in Westmorland, and *Sticta Thouarsii* and *S. crocata* occur near Oban and elsewhere on the west of Scotland. Several species usually sterile in Britain have been found in fructification in moderate abundance in Cornwall. Amongst these may be especially noticed *Roccella fuciformis* and *R. phycopsis*, *Parmelia Borreri*, *P. caperata*, *P. perlata*, and *Physcia flavicans*.

The following are some of the rarer lichens found in the county, which are characteristic of a southern flora: *Myriangium Duriei*, found only in Cornwall and the Channel Islands, chiefly on ash trees; *Sticta aurata*, found in the Scilly Islands, but extremely rare in Dorset and Hants; *S. Dufourei*, *Physcia speciosa*, *P. leucomela*; *Opegrapha amphotera* elsewhere recorded only from Bala Lake in Wales; *Lecanora subexigua*, *L. discorella*, *L. Ralfsii*, *Lecidea strepsodina*, *L. herbarum*, *L. scopulicola*, *Opegrapha lentiginosa*, *O. Cæsariensis*, *O. grumulosa*, *Lithographa petræa*, *L. dendrographa*, *Arthonia ilicina*, *Graphis Lyellii*, *G. Ruiziana*, *Stigmatidium circumscriptum*, *Chiodecton Sarniense*, and the maritime species of *Verrucaria*. The *Graphidiei* are particularly well represented in the county, almost as richly indeed as in the south-west of Ireland. *Ramalina Curnowii*, named after Mr. William Curnow, one of the princes of Cornish botanists, does not appear to have been detected elsewhere,

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except in Jersey. One very rare species, *Placodium fulgens*, forms a zone of a golden yellow colour on a calcareous sand dune near Padstow, and also occurs on flat ground near Constantine Bay.

The species common on old trees or old wood in drier countries are remarkable for the absence of records, especially the genera *Calicium* and *Pblyctis*. The species of the genus *Pertusaria*, though fairly represented, do not appear to fruit so freely as in the Devonshire ravines. The *Collema* also, as might be expected from the absence of limestone, are not very numerous. Where limestone does occur however, as at Cremyll near Mount Edgcumbe, species characteristic of that formation, such as *Placodium cirrhocbroum*, *Lecanora ochracea*, *L. calcarea*, *Verrucaria immersa*, and *V. conoidea*, etc., are met with. The *Gyrophorei*, which are fairly abundant on the Dartmoor Tors, are represented in Cornwall very sparingly, *Umbilicaria pustulata* and *U. polyrrhiza* only having been detected hitherto, the former at St. Breward, Helmentor, and Tremoran Hill, and the latter only near Helmentor. *Lithographa dendrographa* appears to occur much more sparingly than in Devon, but *Stigmatidium circumscriptum* is noticeable everywhere near the sea on the clay slate and the serpentine, growing often in the most provoking manner across the grain of the clay slate, so that it is almost impossible to get a good specimen.

Although so large a proportion of the British lichen flora has been detected in Cornwall, there is little doubt that many rare species will yet be found on the maritime rocks and inland coppices, and possibly on old trees in some of the parks scattered through the county.

The classification followed is that of Crombie's *British Lichens* as far as *Urceolaria* and Leighton's *British Lichen Flora* from *Lecanora* to *Melanthea*, the species being arranged alphabetically for facility of reference.

The rarer species in the list are indicated by an asterisk.

EPHEBACEI, Nyl.

- Sirosiphon compactus*, Kütz. *W.C.*
- Gonionema velutinum*, Nyl. *St. Cleer, E.C.*
- Ephebe pubescens*, Nyl. *E.C., Rough Tor*
- Lichina pygmæa*, Lightf. *St. Minver, E.C.; Penzance, Scilly Isles*
- *confinis*, Ach. *Antony, E.C.; Fal-mouth, Penzance*

COLLEMACEI

- Collema cheileum*, Ach., f. *nudum*, Nyl. *E.C.*
- *concinnum*, Flot. *Penzance*
- *crispum*, Ach. *St. Minver*
- sub-sp. *ceranoides*, Nyl. *St. Minver, Penzance*
- f. *cristatulum*, Nyl. *St. Minver*
- *flaccidum*, Ach. *Boconnoc, Camelford, St. Minver*
- *furvum*, Ach. *Porth Burrow*
- *glaucescens*, Hoffm. *E.C.*
- *granuliferum*, Nyl. *St. Minver*
- *nigrescens*, Ach. *Lizard, Penzance*

COLLEMACEI (continued)

- Collema plicatile*, Nyl. *E.C.*
- var. *hydrocharum*, Nyl. *W.C.*
- *pulposum*, Ach. *W.C.*
- var. *pulposulum*, Nyl. *E.C.*
- *tenax*, Ach. *E.C.*
- Collemodium biatorinum*, Nyl. *Wadebridge*
- *fluviatile*, Nyl. *St. Minver*
- *Schraderi*, Nyl. *"*
- *turgidum*, Nyl. *Wadebridge*
- Leptogium amphineum*, Nyl. *Penzance*
- *lacerum*, Gray, f. *fimbriatum*, Hoffm. *E.C.*
- sub-sp. *pulvinatum*, Nyl. *Hayle Sands*
- sub-sp. *lophæum*, Nyl. *E.C.*
- *Scotinum*, Fr. *Hayle Sands*
- *musculum*, Fr. *Penzance*
- *palmatum*, Mont. *Marden Woods near Penzance*
- *subtile*, Nyl. *Withiel*
- *tenuissimum*, Kœrb. *Penzance*
- *tremelloides*, Gray. *St. Issey, Ruan Minor, Lamorna*

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CALICIEI

- Calicium trachelinum*, Ach. *E.C.*
Spinctrina turbinata, Fr. *Withiel*

SPHÆROPHOREI

- Sphærophoron compressus*, Ach. *W.C.*
 — *coralloides*, Pers. *Helmentor, Cheese-
 wring, Zennor, Penzance*
 — *fragilis*, Ach. *Liskeard*
Bæomyces roseus, Pers. *St. Breock Down,
 Tregawn, Trengwainton*
 — *rufus*, DC. *Withiel, Boconnoc*
 var. *subsquamulosus*, Nyl. *Bodmin*

STEREOCAULEI

- Stereocaulon coralloides*, Fr. *Helmentor,
 Cheese wring*
 — *evolutum*, Graewe. *E.C.*
Leprocaulon nanum, Nyl. *Lamorna, Hel-
 mentor*

CLADONIEI

- Pycnothelia* **papillaria*, Dufl. *St. Breock,
 Zennor. (Rare in Cornwall)*
Cladonia alpicornis, Fløerke. *Withiel,
 Scilly Isles*
 — *bacillaris*, Nyl. *Wadebridge*
 var. *sub-coronata*, Nyl. *St. Breward*
 — *bellidiflora*, Fløerke. *Hustyn Down, E.C.*
 — *cæspititia*, Fløerke. *St. Breward, E.C.*
 — *cariosa*, Spreng. *W.C.*
 — *cervicornis*, Schær. *Withiel, Penzance*
 — *coccifera*, Schær. *St. Breward, Wade-
 bridge*
 f. *cornucopioides*, Fr. *St. Breward*
 sub-sp. *pleurota*, Cromb. "
 — *deformis*, Hoffm. *E.C.*
 — *delicata*, Fløerke. *St. Breward, E.C.*
 — *digitata*, Hoffm. *W.C.*
 — *fimbriata*, Fr. *Truro*
 var. *conista*, Nyl. *Lanivet*
 var. *tubæformis*, Fr. *St. Breward,
 E.C.*
 f. *macra*, Cromb. *Bodmin*
 — *furcata*, Hoffm. *Temple Moor*
 var. *corymbosa*, Nyl. *Withiel, Pen-
 zance*
 sub-sp. *racemosa*, Nyl. *E.C.*
 f. *recurva*, Fløerke. "
 — *gracilis*, Hoffm. *Penzance*
 — *Lamarckii*, Nyl. *Bodmin*
 — *macilenta*, Hoffm. *Withiel*
 f. *styracella*, Nyl. "
 f. *clavata*, Fr. *W.C.*
 var. *scabrosa*, Nyl. *Bodmin, W.C.*
 var. *coronata*, Nyl. " "
 — *ochrochlora*, Fløerke. *Bodmin*
 f. *ceratodes*, Fløerke. "
 — *pityrea*, Fløerke. *Helmentor*
 — *pungens*, Fløerke. *St. Merry, Pen-
 zance*
 — *pyxidata*, Fr. *St. Breward, Bodmin*
 f. *lophyra*, Coem. *St. Breock*

CLADONIEI (continued)

- Cladonia pyxidata*, Fr.
 var. *pocillum*, Fr. *Bodmin*
 var. *chlorophæa*, Fløerke. *Helmentor,
 Penzance*
 — *scabriuscula*, Nyl. *Penzance*
 — *sobolifera*, Nyl. *St. Breock, Helmentor*
 — *squamosa*, Hoffm. "
 f. *cucullata*, Nyl. *Withiel*
 — *subsquamosa*, Nyl. *Penzance, E.C.*
 — *verticillata*, Fløerke. *St. Breock*
 f. *laciniolata*, Nyl. *Carn Galva*
 — *sylvatica*, Nyl. *Tregawn*
 f. *lacerata*, Nyl. *Bodmin*
 f. *portentosa*, Leight. *Penzance*
 — *uncialis*, Nyl. *Respryn, near Lanhy-
 drock*
 f. *adunca*, Cromb. *Withiel, Pen-
 zance*
 f. *turgescens*, Cromb. *W.C.*

ROCCELLEI

- Roccella fuciformis*, DC. *Tintagel, Lizard
 (in fruit), Lamorna Cove, Logan Rock*
 — *phycopsis*, Ach. *Tintagel, Lizard (in
 fruit), Pentire*
 f. *tenuior*, Nyl. *E.C., Scilly Isles*

RAMALINEI

- Ramalina calicaris*, Nyl. *Respryn, Pen-
 zance*
 var. *subampliata*, Nyl. *Penzance*
 var. *subfastigiata*, Nyl. "
 — *Curnowii*, Cromb. *Penzance, Land's
 End; St. Mary's, Scilly Isles*
 — *cuspidata*, Nyl. *St. Breock, Tintagel,
 Lizard, Land's End*
 f. *minor*, Nyl. *Fowey, Penzance*
 var. *crassa*, Del. *Penzance*
 sub-sp. *breviuscula*, Nyl. *Polperro,
 Tintagel*
 — *evernioides*, Nyl. *Endellion, Tintagel*
 — *farinacea*, Ach. *Withiel, Penzance*
 sub-sp. *intermedia*, Nyl. "
 — *fastigiata*, Ach. *Penzance, Withiel*
 — *fraxinea*, Ach. "
 var. *ampliata*, Ach. *E.C.*
 — *pollinaria*, Ach. *Penzance, Lizard,
 Tresco, Scilly Isles*
 f. *humilis*, Ach. *Penzance*
 — *polymorpha*, Ach., f. *ligulata*, Ach.
W.C.
 — *scopulorum*, Ach. *St. Michael's Mount,
 Lamorna, Land's End; St. Mary's,
 Scilly Isles*
 var. *incrassata*, Nyl. *Penzance*
 — *subfarinacea*, Nyl. " (fruit),
Annet, Scilly Isles (fruit)

USNEEI

- Usnea articulata*, Hoffm. *Liskeard*
 — *ceratina*, Ach., f. *ferruginascens*, Cromb.
Withiel

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USNEEI (*continued*)

- Usnea dasypoga*, Nyl. *E.C., W.C.*
 — *florida*, Ach. *E.C., Boconnoc, Penzance*
 — *hirta*, Hoffm. *E.C., Penzance*
Alectoria bicolor, Nyl. *Helmentor, W.C.*
 — *jubata*, Nyl. *Helmentor, Rough Tor*
 sub-sp. *chalybeiformis*, Nyl. *Trungle Moor, W.C.*

CETRARIEI

- Cetraria aculeata*, Fr.
 f. hispida, Cromb. *E.C., Scilly Isles*
Platysma glaucum, Nyl. *Lamorna, Helmentor, Castallack*
 f. fallax, Nyl. *Helmentor*
 — *ulophyllum*, Nyl. *W.C., Castallack*
 near *Penzance*

EVERNIEI

- Evernia furfuracea*, Fr. *Helmentor*
 f. ceratea, Nyl. "
 — *prunastri*, Ach.
 f. soresdiata, Ach. *W.C.*

PARMELIEI

- Parmelia Borreri*, Turn. *Withiel, Penzance*
 — *caperata*, Ach. *Boconnoc, Withiel* (in fruit), *Penzance*; *St. Mary's, Scilly Isles*
 — *cetrarioides*, Nyl. *Helmentor*
 — *conspersa*, Ach. *Helmentor, Zennor, Penzance*
 f. isidiata, Leight. *Withiel, Penzance*
 var. *stenophylla*, Ach. *Penzance*
 — *exasperata*, Nyl. *Withiel*
 — *fuliginosa*, Nyl. *St. Breock* (in fruit), *Penzance*
 var. *lætevirens*, Nyl. *Penzance*
 — *lævigata*, Ach. *Withiel, Penzance*
 — *lanata*, Wallr. *Cornwall* (Mr. Stephens)
 var. *b. lætevirens*, Nyl. *Penzance*
 — *Mougeotii*, Schær. *Withiel, Penzance*
 — *omphalodes*, Ach. *Helmentor, Trungle Moor, Penzance*
 var. *b. panniformis*, Ach. *Helmentor, Penzance*
 — *perforata*, Ach. *Withiel, Penzance*
 — *perlata*, Ach. *Boconnoc, Withiel, Penzance* (in fruit)
 sub-sp. *ciliata*, Nyl. *Helmentor, Penzance, Scilly Isles*
 — *pertusa*, Schær. *Tregawn, Penzance, Zennor*
 — *physodes*, Ach. *E.C., Lamorna*
 f. labrosa, Ach. *Withiel, Penzance*
 f. tubulosa, Midd. "
 f. platyphylla, Ach. *E.C.* "
 — *prolixa*, Nyl., sub. sp. *Delisei*, Nyl. *Penzance*
 var. *isidiascens*, Nyl. *Helmentor, Penzance*

PARMELIEI (*continued*)

- Parmelia reddenda*, Stirt. *Redruth, Penzance*
 — *revoluta*, Nyl. *Withiel, Penzance*
 var. *rugosa*, Cromb. *Lizard*
 f. panniformis, Cromb. *Helmentor, Pentire*
 — *saxatilis*, Ach. *Redruth, Penzance*
 f. furfuracea, Schær. *Helmentor, Penzance*
 — *scorteia*, Ach. *E.C.*
 — *sinuosa*, Ach. *W.C., Trengwainton*
 near *Penzance*
 — *subaurifera*, Nyl. *Penzance*
 — *sulcata*, Tayl. *Withiel, Penzance*
 — *tiliacea*, Ach. *E.C.*
 — **xanthomyela*, Nyl. *W.C.*
Stictina crocata, Nyl. *Carn Galva, Zennor*
 — *Dufourei*, Nyl. *Menbeniot, Liskeard, Pentire, Lizard*
 — *fuliginosa*, Nyl. *Launceston, Boconnoc, Camelford, Penzance*
 — *limbata*, Nyl. *Boconnoc, Withiel, Penzance*
 — *sylvatica*, Nyl. *Boconnoc, Penzance*
Lobarina scrobiculata, Nyl. *Liskeard, Tregawn, Helmentor, Lamorna*
Lobaria pulmonaria, Hoffm. *Boconnoc, Camelford, Pentire, St. Minver, Liskeard, Helmentor, Penzance*
 f. hypomela, Cromb. *Bryher Island, Scilly*
Sticta aurata, Ach. *Tresco and Bryher Islands, Scilly*
Ricasolia amplissima, Leight. *St. Minver, Boconnoc, Lamorna*
 — *lætevirens*, Leight. *St. Austell, Boconnoc, Lizard, Bryher Island, Scilly*

PELTIGEREI

- Nephromium lusitanicum*, Nyl. *Launceston, Respryn, Liskeard*
 — *parile*, Nyl. *E.C., St. Austell, Lizard*
 f. panniforme, Cromb. *Penzance*
 f. hibernicum, Nyl. *Launceston*
Peltigera canina, Hoffm. *Withiel, Penzance*
 var. *membranacea*, Nyl. *Penzance*
 — *horizontalis*, Hoffm. *Pentire*
 — *polydactyla*, Hoffm. *Withiel, Penzance*
 — *rufescens*, Hoffm. *Penzance*
 f. prætextata, Fløerk. *Boconnoc*
 — *scutata*, Leight. *Withiel*

PHYSICIEI

- Physcia adglutinata*, Nyl. *Penzance*
 — *aipolia*, Nyl. (?) "
 var. *cercidia*, Nyl. *Withiel, Penzance*
 — *aquila*, Nyl. *Roche Rocks, Helmentor, Penzance, Lizard*
 — *astroidea*, Nyl. *Penzance*
 — *cæsia*, Nyl. *Withiel, Penzance*
 f. teretiuscula, Nyl. *Penzance*

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PHYSICIEI (continued)

- Physcia ciliaris*, DC., var. *saxicola*, Nyl. *Withiel*
 — *erosa*, Leight. *Withiel*, *Penzance*
 — *flavicans*, DC. *Bude*, *Boconnoc*, *Withiel*, *Penzance* (in fruit)
 — *leucomela*, Mich. *Bray*, *Altarnum*, *Lizard*, *Scilly Isles*
 — *lychnea*, Nyl. *St. Austell*, *Penzance*
 — *parietina*, De Not.
 var. *aureola*, Nyl. *Withiel*
 f. *congranulata*, Cromb. *St. Minver*
 — *pulverulenta*, Nyl. *Withiel*
 var. *angustata*, Nyl. *Bodmin*
 sub-sp. *pityrea*, Nyl. *Penzance*
 sub-sp. *venusta*, Nyl. "
 — *speciosa*, Nyl. *Rough Tor*, *Lizard*
 var. *hypoleuca*, Ach. *Rough Tor*
 — *stellaris*, Nyl.
 var. *leptalea*, Nyl. *Bodmin*, *Penzance*
 sub-sp. *tenella*, Nyl. *Withiel*, *Penzance*
 — *tribacia*, Nyl. " "
 — *tribacoides*, Nyl. *Penzance* "
 — *ulothrix*, Nyl. "
 var. *viarella*, Cromb. *Newlyn Cliff*

GYROPHOREI

- Umbilicaria pustulata*, Hoffm. *Helmentor*
Gyrophora polyphylla, Turn. & Borr. *St. Cleer*
 — *polyrrhiza*, Körb. *Helmentor*

PLACODEI

- Pannaria rubiginosa*, Del. *Boconnoc*, *Respryn*
 var. *b. coeruleobadia*, Mudd. *Withiel*
 var. *c. nebulosa*, Nyl. *St. Germans*, *Withiel*, *Penzance*
Pannularia microphylla, Nyl. *Penzance*
 f. *cheilea*, Nyl. *E.C.*
 f. *triptophylla*, Nyl. *St. Breock*
 f. *nigra*, Nyl. *St. Minver*
 f. *carnosa*, Cromb. *Penzance*
Coccocarpia plumbea, Nyl. *St. John's*, *Boconnoc*, *Respryn*, *Bodmin*, *Pentire*, *Penzance*
 var. *b. myriocarpa*, Nyl. *Penzance*
Leproloma lanuginosum, Nyl. *Roche Rocks*
Psoroma hypnorum, Hoffm. *Respryn*, *Tresco*, *Scilly Isles*
Squamaria crassa, Sm. *St. Merryn*
 — *saxicola*, Sm. *Penzance*
 var. *diffRACTA*, Nyl. *St. Minver*
Placopsis gelida, Nyl. *St. Austell*
Placodium callopismum, Mudd. *E.C.*
 sub-sp. *sympageum*, Nyl. *St. Mawes*
 — *cirrochroum*, Cromb. *E.C.*
 — *fulgens*, Gray. *St. Minver*
 — *Lallavei*, Cromb. *St. Austell*
 — *lobulatum*, Mudd. *St. Mawes*, *E.C.*
 — *murorum*, Leight. *St. Austell*
Candelaria laciniosa, Nyl. *Penzance*
 — *vitellina*, Nyl. *St. Minver*

PLACODEI (continued)

- Lecanora *æquata*, Nyl. Only found at *Penzance*
 — *aipospila*, Ach. *Lizard*, *Penzance*, *Tol-Pedn-Penwith*
 — *albella*, Ach. *E.C.*
 — *atrocinerea*, Nyl. *Penzance*
 — *aurantiacea*, Nyl. *Cornwall* (Crombie)
 sub-sp. *erythrella*, Nyl. *Penzance*
 — *badia*, Flot.
 — **cæzio-cinerea*, Nyl. *Rough Tor*, *Penzance*
 — *cæsiurufa*, Nyl. *Lizard*
 — *calcarea*, Somm. *Penzance*
 — *cerina*, Ach. *Tregawn*, *Truro*, *Trengwainton*
 f. *cyanolepra*, Nyl. *Withiel*
 — *cinerea*, Somm. *St. Minver*
 — *citrina*, Ach. *Withiel*
 — *coccinea*, Cromb. *Penzance*
 — **coniopta*, Nyl. "
 — *effusa*, Ach. "
 — **erysibe*, Nyl. "
 — **var. b. sincerior*, Nyl. *Torpoint*
 — *eucarpa*, Nyl. *Scilly Isles*
 — *expallens*, Ach., var. *lutescens*, Nyl. *Roche*
 — *ferruginea*, Nyl. *Boconnoc*, *St. Minver*, *Penzance*
 var. *festiva*, Nyl. *Penzance*
 — *fuscata*, Nyl.
 — *glaucoma*, Ach. *St. Minver*, *Penzance*
 — **holophæa*, Nyl. *Penzance*
 var. *glaucozpora*, Nyl. *Tamsquite*, *St. Tudy*, *Endellion*, *Penzance*
 — **Hutchinsiae*, Nyl. *St. Johns*, *E.C.*, *Penzance*
 — *irrubata*, Nyl. *Penzance*
 — **lacustris*, Fr. *Withiel*
 — *milvina*, Ach. *Penzance*
 — *ochracea*, Nyl. *E.C.*
 — *orosthea*, Ach. *Land's End*
 — *pallescent*, Nyl. *Launceston*
 — *phlogina*, Nyl. *Penzance*
 — *poliophæa*, Ach. *Tol-Pedn-Penwith*
 — *polytropa*, Schrad. *Penzance*
 — **prosechoides*, Nyl. "
 — *pyracea*, Nyl. *St. Merryn*, *Penzance*
 — **Ralfsii*, Cromb. *Lizard*, *Penzance*, *Scilly Isles*
 — *roboris*, Nyl. *Launceston*, *Penzance*
 — *simplex*, Nyl. *Withiel*, *Tintagel*, *Penzance*
 — **smaragdula*, Nyl. *Redruth*
 — **subcarnea*, Ach. *Pentire*
 — **subexigua*, Nyl. Only found at *Penzance*
 — *subfusca*, Nyl.
 var. *b. campestris*, Nyl. *Withiel*, *Penzance*

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PLACODEI (continued)

- Lecanora subfusca*, Nyl.
 sub-sp. *chlaronia*, Nyl. *Withiel*
 *f. *pinastris*, Cromb. *Penzance*
 — *sulphurea*, Ach. *St. Minver, Penzance*
 — *symmictera*, Nyl. *Penzance*
 — *tartarea*, Ach. *Lamorna*
 sub-sp. *subtartarea*, Nyl. *Rough Tor*
 — *umbrina*, Nyl. *Lamorna Cliffs, Penzance*
 — *ventosa*, Ach. *Morvab*
 — **Zosteræ*, Nyl. *Pentire, Lizard*
 (?) *Dirina repanda*, Nyl. *E.C.*
Pertusaria amara, Nyl. *Withiel, Penzance*
 — *ceuthocarpa*, Turn. & Borr. *Pentire, Lamorna, Roscorla, Lizard*
 f. *Westringii*, Nyl. *Pentire, St. Austell, Penzance, Trevayler*
 — *communis*, Nyl. *Withiel*
 — **concreta*, Nyl. *W.C.*
 — *dealbata*, Nyl. *St. Austell, Penzance*
 — *globulifera*, Nyl. *Boconnoc, Withiel*
 — **inquinata*, Fr. *Newquay, Penzance*
 — *leioplaca*, Schær. *Withiel, W.C.*
 — **melaleuca*, Sm. *W.C.*
 — *multipunctata*, Nyl. *Boconnoc*
 — *pustulata*, Nyl. *Trevayler*
 — **velata*, Nyl. *Penzance*
 — *Wulfenii*, DC. *Boconnoc, Withiel*
Phlyctis argena, Ach. *Flushing*
Thelotrema lepadium, Ach. *St. Breock, Withiel*
Urceolaria scruposa, Ach. *Padstow, Endellion, St. Issey*
 sub-sp. *bryophila*, Ach. *St. Minver, Penzance*
Lecidea abietina, Ach. *W.C.*
 — *alboatra*, Hoffm.
 f. *epipolia*, Ach. *E.C., W.C.*
 f. *margaritacea*, Ach. *W.C.*
 — **albocœrulescens*, Wulf. *E.C., W.C.*
 — **albobarnea*, Nyl. *W.C.*
 — **anomala*, Fr. *Lamorna*
 — **aphanoides*, Nyl. *W.C.*
 — **applanata*, Fr. "
 — *atroalba*, Ach. *E.C.*
 — *atroalbella*, Nyl. *E.C., W.C.*
 — *atrourufa*, Dicks. *Lamorna*
 — *cœruleonigricans*, Lightf. *St. Minver*
 — *calcareæ*, Weis. *E.C.*
 — *calcivora*, Ehr. "
 — *carneolutea*, Turn. *Rosemorran*
 — *chalybeia*, Borr. *Laneast Down*
 — **chlorophæa*, Hepp. *E.C., W.C.*
 — *citrinella*, Ach. "
 — **coracina*, Ach. *W.C.*
 — *coralloidea*, Stirt. "
 — **crustulata*, Ach. *E.C.*
 — *cupularis*, Ehr. *Penzance*
 — *cyrtella*, Ach. *W.C.*

PLACODEI (continued)

- Lecidea dealbatula*, Nyl. *W.C.*
 — *decolorans*, Flk. *E.C., Hayle*
 — *denigrata*, Fr. *Penzance*
 — **diducens*, Nyl. *W.C.*
 — *diluta*, Pers. "
 — *dilutiuscula*, Nyl. *E.C.*
 — *disciformis*, Fr. *E.C., Lamorna*
 — *discolor*, Hepp. *W.C.*
 — *endoleuca*, Nyl. *Withiel*
 — *enterochlora*, Tayl. *W.C.*
 — *enteroleuca*, Ach. *E.C., Penzance*
 — *excentrica*, Ach. *E.C., W.C.*
 — *flexuosa*, Fr. *W.C.*
 — *fuliginosa*, Tayl. "
 — **fusco-atra*, Ach. *E.C.*
 f. *fumosa*, Ach. "
 f. *meiosporiza*, Nyl. *W.C.*
 *f. *Mosigii*, Ach. *E.C., Luxulyan*
 — *gelatinosa*, Flk. *W.C.*
 — *grossa*, Pers. *E.C.*
 — **hemipolioides*, Nyl. *W.C.*
 — **herbarum*, Hepp. *Newquay, Lizard*
 — *incompta*, Borr. *Saltsb*
 — **jurana*, Schaer. *Helmentor*
 — **lactea*, Flk. *W.C.*
 — **Lightfootii*, Sm. *Trevayler*
 — *lithophila*, Ach. *E.C., W.C.*
 — *lutea*, Dicks. *E.C., Luxulyan*
 — **Mooreana*, Carr. *E.C.*
 — **morio*, Ram. *Penzance*
 — **muscorum*, Sm. *E.C., St. Merryn*
 — **mutabilis*, Fr. *Bodmin*
 — *obscurata*, Ach. *E.C.*
 — *œderi*, Sm. *Launceston*
 — **oxyspora*, Tul. *Luxulyan*
 — *parasitica*, Flk. *E.C., W.C.*
 — *Parmeliarum*, Smrf. *E.C.*
 — **phacodes*, Kœrb. *W.C.*
 f. *chlorotica*, Ach. *Millbrook, Falmouth*
 — **plicatilis*, Leight. *W.C.*
 — **premneoides*, Nyl. "
 — *protrusa*, Fr. *E.C., W.C.*
 — **pulverea*, Borr. "
 — *rivulosa*, Ach. *W.C.*
 f. *depressa*, Leight. *W.C.*
 — *sabuletorum*, Flk. *E.C., W.C.*
 — *Salweii*, Borr. *E.C., Penzance*
 — **sarcogynoides*, Kœrb. *Helmentor*
 — **saxatilis*, Schaer. *W.C.*
 — **saxorum*, Mass. "
 — **scopulicola*, Nyl. " (only recorded from *Penzance*)
 — *sorediza*, Nyl. *W.C.*
 — *sphæroides*, Dicks. *E.C.*
 — **squamulosa*, Deak. *E.C., Penzance*
 — *stellulata*, Tayl. *E.C., W.C.*
 — **strepsodina*, Ach. *W.C.*
 — **subdisciformis*, Leight. *E.C., W.C.*
 var. *meiosperma*, Nyl. *W.C.*

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PLACODEI (continued)

- Lecidea subumbonata, Nyl. *W.C.*
- *subviridescens, Nyl. *E.C.*
- *Taylori, Salw. *E.C., W.C.*
- tricolor, With. "
- truncigena, Ach. *W.C.*
- uliginosa, Schrad. *E.C., W.C.*
- umbrina, Ach.
 - f. compacta, Ach. *W.C.*
 - f. pelidniza, Nyl. *E.C., W.C.*
- verruculosa, Borr. *W.C.*
- *viridescens, Schrad. *E.C., W.C.*
- vitellinaria, Nyl. *W.C.*

GRAPHIDIEI

- Odontotrema *majus, Leight. *E.C.*
- Lithographa *dendrographa, Nyl. *Menheniot*
- *petræa, Dur. *W.C.*
- Opegrapha *amphotera, Nyl. *Lelant*
- *areniseda, Nyl. *W.C.*
- arthonoidea, Leight. "
 - f. hapalea, Ach.
 - f. nigrita, Leight. *E.C.*
 - f. parallela, Leight. "
- *atricolor, Sirt. "
- *Cæsareensis, Nyl. *E.C., Lizard*
- *confluens, Ach. *E.C., St. Michael's Mount*
- *grumulosa, Duf. *Pentire*
- *lentiginosa, Lyell. *Bodmin*
- Turneri, Leight. "
- Stigmatidium *circumscriptum, Leight. *Torpoint, Lizard*
- crassum, Dub. *E.C., Penzance*
- *Hutchinsiae, Leight. *Saltash, St. Germans, Whitsand Bay*
- f. corticola. *Whitsand Bay, Penzance*
- Arthonia astroidea, Ach. *E.C., W.C.*
- epipasta, Ach. *Bodmin*
- *ilicina, Tayl. "
- lurida, Ach. *E.C., W.C.*
- pruinosa, Ach. *Trerise, Ruan Major*
- *punctiformis, Ach. *Penzance*
- *spadicea, Leight. *E.C., W.C.*
- Swartziana, Ach. "
- varians, Leight. *Pentire, Penzance*
- Graphis *dendritica, Ach. *Withiel, Trevayler*
- f. acuta, Leight. *Bodmin*
- inusta, Ach. *Withiel*
- f. divaricata, Leight. *E.C.*
- f. elongata, Leight. "
- f. macularis, Leight. "
- f. simpliciuscula, Leight. *E.C.*
- f. vera, Leight. *Penzance*
- *Lyellii, Sm. *Liskeard, Falmouth*
- f. macularis, Carroll. *E.C.*
- f. radiata, Carroll. "
- *Ruiziana, Fee. *Bodmin*
- Chiodecton albidum, Leight.
 - *var. sarniense, Salw. *Pentire*

PYRENOCARPEI

- Normandina lætevirens, Turn. & Borr. *Helmentor, Carn Galva, W.C.*
- pulchella, Borr. *Launceston, Trevayler*
- Endocarpon *fluviatile, DC.
 - *var. euplocum, Ach. *Kynance*
- *hepaticum, Ach. *Penzance*
- miniatum, Linn. *Tintagel, Lamorna*
- *rufescens, Ach. *Penzance*
- Verrucaria *antecellens, Nyl. *Bodmin*
- biformis, Borr. *E.C.; Trerise, Ruan Major*
- Cerasi, Ach. *E.C., Bosnieves*
- chlorotica, Ach. *Bedruthan Steps*
- f. carpineae, Schaer.
- *f. codonoidea, Leight. *W.C.*
- f. subintegra, Nyl. "
- cinerea, Pers. *W.C.*
- *cinerella, Flot. "
 - var. megaspora, Nyl. *E.C., W.C.*
- *conformis, Nyl. " "
- conoidea, Fr. *E.C.*
- Dufourei, DC. "
- erratica, Mass. *W.C.*
- *fuscella, Turn. *E.C., Penzance*
- gemmifera, Tayl. *E.C., W.C.*
- glabrata, Ach. *Trevayler*
- var. dermatoides, Borr. *W.C.*
- *halizoa, Leight. *Bedruthan Steps; Trerise, Ruan Major; Penzance*
- halophila, Nyl. *Bedruthan Steps, W.C.*
- horistica, Leight. *E.C.*
- immersa, Leight. *E.C., Castle Horneck near Penzance*
- *integra, Nyl. *E.C.*
- lectissima, Fr. *E.C., Tremenheere near Penzance*
- *litoralis, Tayl. *W.C.*
- *macrostoma, Duf. *Penzance*
- margacea, Wahl. *Saltash*
- var. acrotella, Ach. *E.C., W.C.*
- var. æthiobola, Wahl. " "
- *var. papillosa, Ach. *E.C., W.C., Padstow, Bedruthan Steps*
- maura, Wahl. *Penzance*
- mauroides, Schær. "
- microstoma, Duf. *E.C.*
- mucosa, Wahl. *E.C., W.C.*
- *murina, Leight. *St. Ives, Lelant*
- *nitescens, Salw. *E.C., Penzance*
- olivacea, Borr. *Trerise*
- *perminuta, Deak. *Penzance*
- plumbea, Leight. *Castallack Cove near Penzance*
- *polysticta, Borr. *E.C.*
- *rugulosa, Borr. *W.C.*
- rupestris, Schrad. *E.C.*
- var. muralis, Ach. *E.C., Madron, Newlyn*
- Salweii, Leight. *E.C., W.C.*

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PYRENOCARPEI (*continued*)

- Verrucaria *striatula, Wahl. *Bedruthan Steps*
 — *sublitoralis, Leight. *E.C., W.C.*
 — *tephroides, Ach. *E.C., Penzance, Land's End*
 — umbrina, Wahl. *Trengwainton*

PYRENOCARPEI (*continued*)

- Verrucaria viridula, Schrad. *E.C., Lizard, Trengwainton*
 Strigula *Babingtonii, Berk. *W.C.*
 Melanotheca gelatinosa, Chev. *Witbiel*
 — *ischnobela, Nyl. *W.C.*

FUNGI

The published records of the species occurring in the county refer almost exclusively to the western half and to the district around Penzance, where the late Dr. Ralfs diligently explored the fungal flora for many years, with the aid, during part of the time, of Mr. E. D. Marquand, Mr. W. Curnow, and other well known botanists. Lists of the species found were published by Dr. Ralfs in the *Report and Transactions of the Penzance Natural History and Antiquarian Society* for 1880-4, pp. 38, 239, 292, 423, and for 1884, pp. 89, 379. A fuller account of them is given in his manuscript *Flora of West Penwith*, already referred to, and to that work through the kindness of Mr. F. C. Davey of Penzance, who volunteered to copy the necessary information, the present writer is greatly indebted.

A number of species new to Britain were discovered by Dr. Ralfs and his coadjutors, and these were also recorded in the volume of *Grevillea* at intervals, from 1880-8. In the following list they are indicated by an asterisk preceding the specific name.

To economize space, the species which are recognized as common have been omitted, in number about 84, exclusive of varieties.

The flora of the Penzance district is so rich, that there is little doubt that the unrecorded common species would readily be found if searched for, and the number of rarities, discovered in so small a portion of the county, indicates that many southern species not yet recorded for Great Britain are likely to occur in the warmer valleys of Cornwall.

The classification followed is that given in Cooke's *Handbook of British Fungi*, but in many cases the names of species have been altered in accordance with the progress of our knowledge of species, especially in the *Pucciniæ*, *Cæomacei* and *Æcidiacei*, in which many forms that were formerly described as species are now known to be merely stages in the life history of others. In these three groups the nomenclature adopted is that of Dr. C. B. Plowright in *A Monograph of the British Uredines and Ustilagines*, London, 1889. Where any difficulty may occur in identifying species given in the following list, with the names given in the work quoted, it can be solved by reference to the synonyms given in Saccardo's *Index Fungorum Universalis*.

Some species of fungi disappear from well known localities for many years; thus *Polyporus heteroclitus*, which was found at Lamorran in September 1882 by Dr. Ralfs, had not been found by any one else since Bolton recorded it 100 years previously; *P. fragilis* has disappeared since the tree on which it grew near Penzance has been destroyed; *Calocera corticalis*, which occurred abundantly on an old door, passed

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away with the removal of the door ; and *Leotia nana* has not been found since the time of Withering, when it was collected at Pendarves by Mr. Stackhouse.

Fungi growing under unusual conditions sometimes develop their stems in curious branched malformations. Such a specimen was found on timber in a mine 250 feet below the surface at Redruth and was identified by the Rev. M. G. Berkeley as a form of *Polyporus squamosus*. Of the species new to Britain, found in Cornwall, *Peziza cornubiensis* and *Capnodium elongatum* have apparently not been recorded from elsewhere in this country.

HYMENOMYCETES

AGARICUS

- (*Amanita*) *muscaria*, Linn. *Kennall Valley*, abundant ; *Trereife*
- (*Lepiota*) **carcharias*, Pers. *Carn Galva*
- *clypeolaris*, Bull. *Trengwainton*
- *granulosus*, Batsch. *Penzance*
var. *amianthinus*, Scop. "
- **illinitus*, Fr. *Pendarves*
- *polystictus*, Berk. *Rosehill near Penzance*
- *rachodes*, Vitt. *Rosemorran, St. Just*
- (*Armillaria*) *mucida*, Fr. *Pendarves, Kenegie*
- **pilulæformis*, Bull. *Trengwainton*
- (*Tricholoma*) *albobrunneus*, Pers. *Rosemorran, Treener*
- **bufonius*, Pers.
- *columbetta*, Fr. *Lamorran*
- *grammopodius*, Bull. *Trewidden*
- *humilis*, Fr. *Marazion*
- *lascivus*, Fr. *Penzance*
- *melaleucus*, Pers. "
- *nudus*, Fr. "
- *rutilans*, Schæff. *Trengwainton, Pendarves*
- (*Clitocybe*) **amplus*, Pers. *Trewidden*
- *brumalis*, Fr. *Trengwainton*
- **cyanophœus*, Fr. *Penzance*
var. *Pengellei*, Berk. "
- **ericetorum*, Bull. } *Rosehill near Penzance*
- **expallens*, Pers. }
- *flaccidus*, Sow. *Trengwainton*
- **gilvus*, Fr. *Trewidden*
- **pithyophilus*, Secr. *Rosemorran*
- *rivulosus*, Pers. *Marazion*
*var. *Neptuneus*, Batsch. *Trewidden*
- (*Collybia*) **collinus*, Fr. *Penzance*
- **hariolorum*, DC. "
- *platyphyllus*, Fr.
var. *repens*, Fr. *Lelant*
- **stipitarius*, Fr. *Lamorran*
- (*Mycena*) *acicula*, Schæff. *Trengwainton*
- **ammoniacus*, Fr. *Penzance*
- **atrocyaneus*, Batsch. *Trewidden*
- *capillaris*, Schum. *Trengwainton*

AGARICUS (continued)

- (*Mycena*) *filipes*, Bull. *Rosemorran*
- *flavo-albus*, Fr. *Penzance*
- *galericulata*, Scop., var. *calopus*, Fr. *Trengwainton*
- *juncicola*, Fr. *Penzance*
- *metatus*, Weinm. "
- *pelliculosus*, Fr. *Carn Galva*
- **plicosus*, Fr. *Lamorran*
- **pullatus*, Berk. & Br. *Penzance*
- *rubromarginatus*, Fr. "
- **rugosus*, Fr. *Pendarves, Rosemorran*
- *speireus*, Fr. *Penzance*
- *tenellus*, Schum. "
- *tenuis*, Bull. "
- *tenerrimus*, Berk. *Rosemorran, Tre-reife*
- *vitilis*, Fr. *Trevethoe, Lelant*
- (*Omphalia*) *demissus*, Fr. *Trengwainton*
- **gracillimus*, Weinm. *Kenegie*
- *hepaticus*, Batsch. *New Mill*
- *muralis*, Sow. *Penzance*
- *pyxidatus*, Bull. *Rosemorran*
- *schizoxylon*, Fr. *Rosehill near Penzance*
- *stellatus*, Sow. *Penzance*
- (*Pleurotus*) **atrocæruleus*, Fr. *Penzance*
- *chioneus*, Pers. *Penzance*
- *cyphellæformis*, Berk. *Penzance*
- **limpidus*, Fr. *Chyandour*
- *mutilus*, Fr. *Penzance*
- *revolutus*, Kickx. "
- *septicus*, Pers. "
- *striatulus*, Fr. "
- (*Volvaria*) *speciosus*, Fr. *Trevayler*
- (*Pluteus*) *leoninus*, Schæff. "
- (*Entoloma*) *ardosiacus*, Bull. *Madron*
- *clypeatus*, Linn. *Men-an-tol*
- *placenta*, Batsch. *Marazion*
- *repandus*, Bull. *Trengwainton*
- *rhodopolius*, Fr. *Kenegie*
- *sericeus*, Bull. "
- Claudopus variabilis*, Pers. *Penzance*
- (*Leptonia*) *lampropus*, Fr. "
- *lazulinus*, Fr. *Lamorran*
- (*Nolanea*) *pascuus*, Pers. *Trevayler*
- (*Pholiota*) *adiposus*, Fr. *Weary-me-out*

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AGARICUS (continued)

- (Pholiota) aurivellus, Batsch. *Penzance*
- capistratus, Cooke. *Trevayler*
- *erebius, Fr. *Kenegie*
- mutabilis, Schæff. *Trereife*
- præcox, Pers. *Marazion*
- pudicus, Bull. *Newlyn*
- spectabilis, Fr. *Kenegie, Rosehill near Penzance*
- *terrigenus, Fr. *Trengwainton*
- (Hebeloma) geophyllum, Fr. Son. *Rosehill near Penzance*
- lacerus, Fr. *Kenegie*
- *maritimus, Fr. *Rosemorran*
- muticus, Fr. *Lamorran*
- pyriodorus, Pers. *Rosehill near Penzance*
- rimosus, Bull. *Trengwainton*
- *scabellus, Fr. *Penzance*
- scaber, Müll. *Rosehill near Penzance*
- trechisporus, Berk. *Trevayler*
- (Flammula) *gummosus, Lasch. *Treener*
- inopus, Fr. *Lamorran*
- picreus, Fr. *Trengwainton*
- sapineus, Fr. *Penzance*
- (Naucoria) erinaceus, Fr. *Penzance*
- graminicola, Nees. *Trengwainton*
- (Tubaria) embolus, Fr. *Penzance*
- (Crepidotus) *applanatus, Pers. *Penzance*
- mollis, Schæff. *Trereife, Lelant*
- *haustellaris, Fr. *Trannack*
- *Ralfsii, Berk. & Br. "
- (Stropharia) æruginosus, Curt. *Trengwainton*
- (Psalliota) squamosus, Fr. *Trevayler*
- campestris, Linn. *Tredavoe*
- var. silvicola, Vitt. *Rosemorran*
- melaspermus, Bull. *Praa Sands*
- *subgibbosus, Fr. *Penzance*
- (Hypholoma) epixanthus, Fr. *Trevelløe*
- lachrymabundus, Fr. *Penzance*
- pilulæformis, Bull. *Trengwainton*
- (Psilocybe) physaloides, Bull. *Carnagwidden*
- (Psathyra) gossypinus, Fr. *Trengwainton*
- (Panæolus) *caliginosus, Jungh. *Madron*
- fimicola, Fr. *Penzance*
- (Psathyrella) *crenatus, Fr. *Marazion*
- hiascens, Fr. *Rosehill near Penzance*
- *hydrophorus, Bull. *Madron*
- (Coprinus) *cothurnatus, Godey. *Rosehill near Penzance*
- extincorius, Fr. *Madron*
- niveus, Fr. *Rosemorran*
- ovatus, Fr. *Ding Dong*
- (Bolbitius) apicalis, W. G. Smith. *Trereife*
- (Dermocybe) cinnamomeus, Fr. *Pendarves*
- (Telamonia) helvelloides, Fr. *Penzance*
- torvus, Fr. *Rosehill near Penzance*
- (Hygrocybe) *acutus, Fr. *Penzance*
- leucopus, Fr. *Rosehill near Penzance*

AGARICUS (continued)

- (Hygrocybe) obtusus, Fr.
 - Reedii, Berk. *Rosemorran*
 - Paxillus giganteus, Fr. *Lamorran*
 - Hygrophorus *glutifer, Fr. *Rosemorran*
 - *nemoreus, Lasch.
 - obrusseus, Fr. *Lamorna, Rosemorran*
 - ovinus, Fr. *Trevayler*
 - russo-coriaceus, Berk. & Br. *Marazion*
 - *vitellinus, Fr. *Ding Dong*
 - Lactarius deliciosus, Fr. *Goldsithney*
 - *aurantiacus, Fl. Dan.
 - Russula depallens, Fr. *Trevayler*
 - nitida, Fr. *Trevelløe, Carn*
 - Cantharellus albidus, Fr. *Kenegie*
 - aurantiacus, Fr., var. lactea, Ralfs MS. *Carnagwidden, Rosehill*
 - Marasmius angulatus, B. & Br. *Pendarves*
 - languidus, Fr. *Madron*
 - Vaillantii, Fr. *Lamorna, Rosehill*
 - Lentinus tigrinus, Fr. *Pendarves, Camborne*
- ## POLYPOREI
- Boletus bovinus, Linn. *Ponsanooth, Trengwainton*
 - parasiticus, Bull. *Tremenbeere, 1880*
 - Polyporus *acanthoides, Fr. *Penzance*
 - adiposus, Berk. & Br. *Trengwainton*
 - amorphus, Fr. *Goldsithney*
 - cæsius, Fr. *Trengwainton*
 - crispus, Fr. *Rosemorran*
 - epileucus, Fr. *Trench*
 - farinellus, Fr. *Rosehill near Penzance*
 - *fragilis, Fr. *New Mill*
 - heteroclitus, Fr. *Lamorran*
 - hirsutus, Fr. *Penzance*
 - intybaceus, Fr. *Lamorran*
 - lucidus, Fr. *Castle Horneck*
 - *Michelii, Fr. *Penzance*
 - molluscus, Fr. "
 - *mucidus, Fr. *Trengwainton*
 - nummularius, Fr. *Penzance*
 - *pectinatus, Kl. "
 - pomaceus, Fr. *Newlyn Cliff*
 - Polyporus Rostkovii, Fr. *Lamorna*
 - *sanguinolentus, Fr. *Trevelløe, Carn*
 - *tephroleucus, Fr. *Lamorran*
 - terrestris, Fr. *Rosemorran*
 - velutinus, Fr. *Penzance*
 - vitreus, Fr. *Trengwainton*
 - Dædalea *cinerea, Fr. *Penzance*
 - *polyzona, Fr. "
 - Merulius molluscus, Fr.

HYDNEI

- Hydnum *aureum, Fr. *Penzance*
- *denticulatum, Pers. "
- *diaphanum, Chr. "
- ferruginosum, Fr. *Trevayler*
- niveum, Pers. *Penzance*
- squalinum, Fr. *Kenegie*

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HYDNEI (continued)

- Hydnum Weinmanni, Fr. *Trereife*
 Irpex *carneus, Fr. *Penzance*
 Phlebia contorta, Fr. "
 — *lirellosa, Pers. "
 — merismoides, Fr. *Kenegie, Lamorran*

AURICULARINEI

- Stereum rufum, Fr. *Kenegie*
 — *stratosum, Berk. & Br. *Penzance*
 — *vorticosum, Fr. *Trengwainton*
 — tabacinum, Fr. *Lower Tremanbeere*
 Auricularia mesenterica, Bull. *Trereife*
 Corticium *maculæforme, Fr. *Penzance*
 — puberum, Fr. *Rosemorran*
 — *umbrinum, Fr. *Penzance*
 — *uvidum, Fr. *Carbis Bay*
 Cyphella *Curreyi, Berk. & Br. *Rosemorran*

CLAVARIEI

- Sparassis crispa, Fr. *Trevayler, Rosemorran, Rosehill, Rosewoon*
 Clavaria acuta, Son. *Penzance*
 — amethystina, Bull. *Rosehill near Penzance*
 — coralloides, Linn. *Trengwainton*
 — flaccida, Fr. *Rosehill near Penzance*
 — *pyxidata, Pers. *Penzance*
 — stricta, Pers. *Trannack, Madron*
 Calocera *corticalis, Fr. *Trereife*
 Typhula gyrans, Fr. *Penzance*

TREMELLINI

- Tremella *brassicæcola, Berk. MS. *Trereife*
 — indecorata, Sommerf. *Penzance*
 — intumescens, Sow. *Trengwainton*
 — versicolor, Berk. & Br. "
 Nematelia nucleata, Fr. "
 Dacrymyces chrysocomus, Tul. *Trevayler*

GASTEROMYCETES

HYPOGÆI

- Octaviana asterosperma, Vitt. *Enys, Ponsanooth*
 Melanogaster ambiguus, Tul. *Trengwainton*

TRICHOGASTRES

- Geaster fornicatus, Fr. *St. Maby*
 — giganteum, Batsch. *Penzance*
 — saccatum, Vahl. *Truro*
 Scleroderma Bovista, Fr. *Kenegie*
 — verrucosum, Pers. *Carbis Bay, Rosehill near Penzance*

MYXOGASTRES

- Reticularia umbrina, Fr. *Trereife*
 Spumaria alba, DC. *Trevellor*
 Diderma lucidum, Berk. *Gulval*
 — vernicosum, Pers. *Pendarves*
 — *effusum, Link. *Tregony*
 Didymium hemisphæricum, Fr. *Trengwainton*

MYXOGASTRES (continued)

- Didymium nigripes, Fr. *Penzance*
 — squamulosum, A. & G. *Rosemorran*
 Physarum nutans, Pers. *Lamorran*
 Angioridium sinuosum, Grev. *Penzance*
 Badhamia hyalina, Berk. *Trengwainton*
 Craterium leucocephalum, Ditm. *Gulval*
 Stemonitis ferruginea, Ehr. *Trevethoe, Lelant*
 — obtusata, Fr. *Rosemorran*
 — ovata, Pers. *Trengwainton*
 Arcyria incarnata, Pers. *Tredarvoe*
 Trichia chrysosperma, DC. *Castle Horneck*
 — pyriformis, Hoffm. *Penzance*
 — *scabra, Rostk. *Rosemorran*
 — variabilis, Pers. *Trewidden*
 Licea cylindrica, Fr. *Rosemorran*
 — fragiformis, Fr. *Penzance*

NIDULARIACEI

- Cyathus striatus, Hoffm. *Castle Horneck*
 Crucibulum vulgare, Tul. *Trevayler*
 Sphæroبولus stellatus, Tode. *Rosehill near Penzance*

CONIOMYCETES

SPHÆRONEMEI

- Sphæroopsis atrovirens, Lév. *Penzance*
 Fuchelia Plowrighti, Nest. "
 Acrosporum compressum, Tode. *Penzance*
 Septoria insularis, Berk. & Br. *Penzance*
 — Lepidei, Desm. "
 — lituus, Berk. & Br. "
 — Ralfsii, Berk. & Br. *Gulval, Treneer*
 — salicella, Berk. & Br. *Penzance*
 Excipula strigosa, Fr. "
 Ceuthospora Laureri, Grev. "

TORULACEI

- Torula pulveracea, Corda. *Penzance*
 Sporidesmium abruptum, Berk. & Br. *Trevethoe*

PUCCINIÆI

- Uromyces Fabæ, Cooke. *Penzance*
 — Rumicis, Schun. *Castle Horneck*
 — Scillarum, Grev. *Penzance*
 — Valerianæ, Wint. "
 — annulosus, Wint. " (1852)
 Puccinia Betonicæ, DC. *Kennall Valley, Penzance*
 — Buxi, DC. *Newlyn, Tredarvoe*
 — Circææ, Pers. *Rosehill near Penzance*
 — Galii, Wint. *Penzance*
 — Glechomatis, DC. " (1852)
 — glomerata, Grev. "
 — Hieracii, Mart. *Madron*
 — Lapsanæ, Fckl. *Gulval*
 — Lychnidearum, Link. *Hea Moor*
 — Phragmitis, Schrot. *Gulval*
 — Primulæ, Grev. *Kennall Valley, Penzance*

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PUCCINIÆI (*continued*)

- Puccinia Smyrni*, Corda. *Kennall Valley*,
Newlyn
— *truncata*, Berk. & Br. *Penzance*
— *Umbilici*, Guép. "
— *variabilis*, Grev. "

CÆOMACEI

- Melampsora mixta*, Plowr. *Gulval*
Coleosporium Sonchi, Plowr. *Penzance*
Cæoma alliorum, Link. "
— *Orchidis*, Alb. & Schw. "

HYPHOMYCETES

STILBACEI

- Stilbum aurantiacum*, Bab. *Penzance*
Atracteum flammeum, Berk. & Br. *Trengwainton*
Tubercularia granulata, Pers. *Penzance*
Myrothecium roridum, Tode. "
— *inundatum*, Berk. *Trengwainton*
Illosporium coccineum, Fr. *Penzance*
— *roseum*, Fr. *Keris Moor*

DEMATIÆI

- Dendryphium atrum*, Corda. *Rosemorran*
Monatospora megalospora, Berk. & Br. *Trereife*
Helminthosporium Smithii, Berk. & Br. *Penzance*

MUCEDINES

- Aspergillus candidus*, Link. *Penzance*
Nematogoneum aurantiacum, Desm. *Trereife*
Peronospora nivea, Ung. *Penzance*
— *parasitica*, DC. "
— *Urticæ*, Casp. "
Haplaria grisea, Link. "
Penicillium candidum, Link. "
Dactylium roseum, Berk.

SEPEDONIEI

- Sepedonium chrysospermum*, Link. *Trevayler*

ASCOMYCETES

ELVELLACEI

- Morchella esculenta*, Pers. *Hayle*
Helvella crispa, Fr. *Lamorran*
— *elastica*, Bull. *Pendarves*
Mitula paludosa, Fr. *Trevayler*
Leotia lubrica, Pers. *Rosemorran*
— *nana*, With. *Pendarves*
Geoglossum glabrum, Pers. *Penzance*
— *hirsutum*, Pers. "
Peziza alboviolascens, A. & S. "
— *auriflava*, Cooke. *Helston*
— *caulicola*, Fr. *Gulval*
— *cerea*, Sow. *Penzance*
— *cochleata*, Huds. *Trevethoe*
— **Cornubiensis*, Berk. & Br. *Penzance*
— *corticalis*, Pers. *Trevayler*
— *epispheeria*, Mart. "

ELVELLACEI (*continued*)

- Peziza fibrillosa*, Curr. *Penzance*
— *fusarioides*, Berk.
— *hemisphærica*, Wigg. *Penzance*
— *humosa*, Fr. "
— **hydnicola*, Berk. & Br. "
— *inflexa*, Bolt.
— *lecideola*, Fr.
— *melaxantha*, Fr. *Trevayler*
— *omphaloides*, Bull. *Penzance*
— **peristomialis*, Berk. & Br. *Trengwainton*
— *repanda*, Wahl. *Rosehill near Penzance*
— *rhabdosperma*, Berk. & Br. *Trevayler*
— *rubra*, Cooke. *Gulval*
— *Schumacheri*, Fr. *Penzance*
— **scutula*, Pers. *Falmouth*
— *subhirsuta*, Schum. *Penzance*
— *theleboloides*, A. & S. *Gulval*
— *umbrosa*, Fr. *Trungle Moor*
— *varicolor*, Fr. *Penzance*
— *villosa*, Pers. "
— *venosa*, Pers., A. & S. *Trengwainton*
— *vulgaris*, Fr. *Castle Horneck*
— *Wrightii*, Berk. *Slabb Hobbo*
Helotium æruginosum, Fr. *Lamorran*
— *calyculus*, Fr. *Madron*
— *claroflavum*, Berk. *Castle Horneck*
— *pallens*, Fr. *Rosemorran*
— *pruinatum*, Jerd. *Trengwainton*
Patellaria atrata, Fr. *Praa Sands*
— *rhabdarbarina*, Berk. *Penzance*
Tympanis conspersa, Fr. "
Cenangium ferrugineum, Fr. *Trengwainton*
— *fuliginosum*, Fr. *Penzance*
— *pulveraceum*, Fr. *Madron, Trevethoe*
Ascobolus viridis, Curn.
Bulgaria sarcoides, Fr. *Pendarves, Chyan-dour*
Stictis radiata, Pers. *Trengwainton*

PHACIDIACEI

- Phacidium dentatum*, Fr.
— *ilicis*, Fr.
Heterosphæria patella, Grev. *Trevayler*
Rhytisma acerinum, Fr. *Penzance*
Hysterium conigenum, Moug. & Nestl. *Golsithney*
— *Fraxini*, Pers. *Penzance*
— *maculare*, Fr. "
— *Pinastri*, Schrad. *Golsithney*
— *pulicare*, Pers. *Trevayler*
— *xyloides*, Chev. *Penzance*
Stegia ilicis, Fr. "
Trochila craterium, Fr. *Trereife*
— *Laurocerasi*, Fr. *Penzance*

SPHÆRIACEI

- Torrubia militaris*, Fr. *Rosemorran*
Hypocrea rufa, Fr. *Lower Trevenheere*
Hypomyces aurantius, Tul. *Trereife*

BOTANY

SPHÆRIACEI (*continued*)

- Nectria aquifolia*, Berk. *Trengwainton*
- *epispæria*, Fr. *Treener, Lelant*
- *erubescens*, Fr. *Trevayler*
- *mammoidea*, Fr. „
- *Peziza*, Fr. *Trengwainton*
- *Ralsfii*, Berk. & Br. *Castle Horneck*
- *sinopica*, Fr. *Trengwainton*
- Xylaria vaporaria*, Berk. *Penzance*
- *argillacea*, Fr. *Trengwainton*
- Hypoxyton rubiginosum*, Fr. *Gulval*
- *serpens*, Fr. *Trevayler*
- *udum*, Fr. *Gulval*
- Eutypa Acharii*, Tul. *Germoe*
- *lata*, Tul. *Rosemorran, Treener*
- *scabrosa*, Fckl. *Trevayler*
- Melogramma gastrinum*, Tul. *Penzance*
- Dothidea filicina*, Fr. *Penzance*
- *graminis*, Fr. „
- *Rosæ*, Fr. „
- *Ulmi*, Fr. „
- Diatrype ceratosperma*, Fr. *Castle Horneck*
- *corniculata*, Berk. & Br. „ „
- *disciformis*, Fr. *Rosehill near Penzance*

SPHÆRIACEI (*continued*)

- Diatrype ferruginea*, Fr. *Madron*
- *hystrix*, Fr. *Rosemorran*
- **leprosa*, Pers. *Trevayler, Trereife*
- *stigma*, Fr. *Trevayler*
- *Ulicis*, Berk. *Trengwainton*
- Melanconis longipes*, Tul. *Penzance*
- Valsa nivea*, Fr. *Treener*
- *prunastri*, Fr. *Penzance*
- *quaternata*, Fr. „
- *salicina*, Fr. *Trereife*
- Sphæria aggregata*, Lasch. *Penzance*
- *aquila*, Fr. *Trevayler*
- *ceuthosporoides*, Berk. *Penzance*
- *clypeata*, Nees. „
- *confluens*, Tode. „
- *cyanogena*, Desm. *Gulval*
- *Desmazierii*, Berk. & Br. *Trengwainton*
- *doliolum*, Pers. *Trevayler*
- *Epochnii*, Berk. & Br. *Trereife*
- *herbarum*, Pers. *Penzance*
- *leprosa*, Pers. „
- *lirella*, Pers. „
- *mastoidea*, Fr. „

ADDENDA

During the two years which have elapsed since this article was prepared many important discoveries have been made, but a list of added species and of the more important of the varieties must suffice. The figures in parentheses correspond with the county-divisions. *Fumaria occidentalis*, Pugsley, in *Journal of Botany*, 1904, 217 (5, 7, 8); a handsome plant, new to science, and at present not known to occur out of Cornwall. *F. Boraei*, Jord. var. *verna*, Cl. (6); var. *muraliformis*, Cl. (6). *F. confusa*, Jord. var. *hibernica*, Pugsley (6). *Polygala serpyllacea*, Weihe, var. *vincoides*, Chodat (6); a striking form quite new to science. *Ulex Gallii*, Planch. var. *humilis*, Planch. (1-8). *Rubus fissus*, Lindl. (4). *R. plicatus*, Wh. and N. var. *hemistemon* (P. J. Muell.) (4). *R. nitidus*, Wh. and N. subsp. *opacus*, Focke (4). *R. cariensis*, Rip. and Genev. (4). *R. argentatus*, P. J. Muell. var. *robustus*, P. J. Muell. (6, 7). *R. macrophyllus* (sp. collect.), var. *macrophylloides* (Genev.) (6). *R. thyrsoides*, Winn. (7). *R. lentiginosus*, Lees (6). *R. pyramidalis*, Kalt. (6). *R. curvidens*, A. Ley (4, 6). *R. infestus*, Weihe (7). *R. rudis*, Wh. and N. (6). *R. podophyllus*, P. J. Muell. (6). *R. rosaceus*, Wh. and N. subsp. *Powellii*, Rogers (6). *R. horridicaulis*, P. J. Muell. (6). *R. dumetorum*, Wh. and N. var. *ferox*, Weihe (3). *Potentilla norvegica*, Linn. (3). *Drosera anglica*, Huds. (5). *Caucalis latifolia*, Linn. (3). *Artemisia maritima*, Linn. (8). *Senecio Cineraria*, DC. (5). *Gentiana lingulata*, C. A. Agardh, var. *præcox*, Townsend (Murbeck) (5). *Euphrasia borealis*, Town. (5). *Nepeta Glechoma*, Benth. var. *parviflora*, Benth. (5, 6). *Galeopsis Tetrabit*, Linn. var. *bifida* (Boenn.) (5, 6). *Salicornia stricta*, Dumort. (5). *S. ramosissima*, Woods (5). *Narcissus odoratus*, Linn. *Potamogeton interruptus*, Kit. (8). *Carex Pairaei*, F. Schultz (7). *Anthoxanthum Puellii*, Lec and Lam. (2).

Further testing of the merits of the records compels the writer to omit the following from the Cornish list: *Ranunculus fluitans*, *Silene conica*, *Stellaria nemorum*, *Arenaria tenuifolia*, *Medicago minima*, *Vicia lathyroides*, *Rubus saxatilis*, *Cenanthe silaifolia*, *Galium Vaillantii*, *Filago apiculata*, *Rhinanthus major*, *Orobancha elatior*, *Cryptogramme crispa*.

As a result of these additions and exclusions, the total strength of the flora of Cornwall is now brought to 1,265 species.

ZOOLOGY

MARINE ZOOLOGY

The unique geographical position of Cornwall as the most southerly as well as the most westerly county in England, and the consequently genial temperature of its waters, its form as a long irregular wedge projecting out into the Atlantic, its two hundred and fifty miles of much indented coast line and the possession of the largest amount of southern 'sea frontage' of all the Channel counties naturally create the highest expectations as to the richness and variety of the marine life in its coastal waters. In spite of the barren character of almost the whole of the north coast with its long sea walls of seamed and fissured cliff and its desolate surf-beaten beaches, first expectations are more than realized in the wealth of species not only in the large sheets of enclosed and sheltered sea like Mount's Bay, Falmouth Bay, Mevagissey and St. Austell Bay and Plymouth Sound and the many land-locked coves and tidal estuaries, but also in the long stretches of coastal waters exposed to the full force of the Atlantic storms. To the great variety of littoral and of sea bottom as well as of exposure are due that delightful diversity of fauna that makes both shore hunting and dredging along this southern coast so full of interest. Fine sand, coarse sand, friable shales, slate rock and granite are all abundantly represented in the happy hunting ground between tide-marks, and on many parts of the coast rock pools are plentiful. The rocks are in places densely covered with *Fucus*, *Pelvetia*, and other brown sea-weeds, frequently arranged in definite zones, and the cracks, crevices, and overhanging ledges of the rocks themselves are often thickly tenanted. The characteristic laminarian and coralline zones are in places extensively developed, and the zostera beds occasionally yield an exciting harvest. In deeper water shell sand alternates with gravel and with stones, and there is in places an admixture of mud with the former. Many of the trawling grounds contain a rich and varied population, which is naturally increased by the frequent patchy character of their deposits. Though the difficulties of dredging on some of the stony bottoms are at times considerable, the results on the average are more than proportionate to the trouble involved.

The richness of the Cornish marine fauna has naturally attracted a large number of enthusiastic local observers, as well as many eminent naturalists from without. Jonathan Couch of Polperro, his son Richard

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Quiller Couch of Penzance, and his staunch disciple and helper William Laughlin the Polperro coastguardsman, together with Mr. C. W. Peach, the indefatigable Dr. Cocks of Falmouth, and Mr. Williams Hockin of Truro, were all of them devoted workers, and they laid a splendid foundation for the study of the marine life of the Cornish seas. Then came that wonderful band of Penzance naturalists, whose studies covered nearly the whole domain of county systematic biology, and whose records in the *Transactions of the Penzance Natural History and Antiquarian Society* (new series) and elsewhere are constantly referred to in almost every natural history article in the present volume. Two at least of these naturalists, namely Mr. Fortescue W. Millett and Mr. George Fox Tregelles, though both departed from the county, are still students of Cornish marine zoology, and from their ripe experience have given great assistance to the writer.

During the past fifteen years the Marine Biological Association has been engaged *inter alia* in a systematic and continuous examination of the marine life of the Plymouth district, and the results as summarized in 'The Plymouth Marine Invertebrate Fauna' in vol. vii, part 2 (1904) of their *Journal* have been laid under extensive tribute for the present article. Between 1890 and 1900 Mr. Rupert Vallentin worked assiduously at the plankton and marine fauna generally of the Falmouth district, and is now engaged in making similar investigations at St. Ives.

Among the naturalists from without who have collected along the Cornish coast are Barlee, Montagu, Forbes, Alder, Jeffreys, Bowerbank, Hincks, Canon Norman, and MacIntosh, and Victor Carus at Scilly, so that references to Cornwall occur in nearly every monograph on the marine life of the British Isles.

In the following annotated list an attempt is made to indicate the distribution of the species in the Cornish seas so far as the available data will permit. Notwithstanding the many observers our knowledge of several of the sections is still in a very fragmentary condition. While the Mollusca and Bryozoa have been widely studied and recorded over a considerable area, the extreme difficulty of identifying the Sponges and Compound Ascidia makes a record of their country distribution impossible, and but for the fortunate circumstance that many of the earlier specimens passed through the hands of Bowerbank and Milne-Edwards respectively, the county lists for these two extensively represented groups would have been meagre in the extreme. Most sections, too, have naturally been much more carefully studied around some centres than others, and certain parts of the coast have received minute attention, while others have been neglected. The Plymouth district, Falmouth Bay, and Mount's Bay have been diligently examined but except on the Mollusca at Hayle and Padstow very little work has been done anywhere along the north coast. Polperro, Fowey, and Gorran are classical ground, but in spite of recent work systematic dredging would be certain to prove remunerative all along the whole of that coast. Very little attention has been given to the waters around the Lizard peninsula, and much remains to be done to the west of Penzance. Victor Carus studied the fauna of the Scillonian seas for several months in 1850, and George Henry Lewes published some jottings on his observations there, but except for the Mollusca comparatively little has been done on the marine life since Carus's visit.

MARINE ZOOLOGY

In the list that follows records of previous county workers are incorporated where there is no doubt as to identification, but there may be omissions due to the inaccessibility of some of the literature to one who is working in the country. The writer's observations on the Cornish marine fauna began nearly twenty years ago, and have been continuous over the last seven years. A large amount of shore collecting has been done from the spring of 1900 onwards by his Nature Study and Biology students at the County Technical Schools, and there are few beaches of importance in the south of the county that have not been visited at low spring tides. Trawl refuse has also received a considerable amount of attention, and though the specimens obtained are frequently in poor condition they are generally sufficient for identification. A good deal of dredging has been carried out in Falmouth Bay and elsewhere, and some awkward but remunerative work done in thirty-five to forty-five fathoms off the Dodman. A long and valuable fauna list has been kindly supplied by Mr. Rupert Vallentin for Falmouth and the neighbourhood, and a large series of unpublished records by Mr. A. Robinson for the Polperro district. Lists have also been received from Mr. E. Heron Allen and from the late Mr. W. E. Baily for Mount's Bay, and considerable assistance has been given by Mr. Matthias Dunn and other members of the County Fisheries Committee. To these and to his many other helpers and co-workers the writer wishes to express his hearty thanks, not only for what they have done but for the spirit in which their help has been given. To his friend Dr. E. J. Allen, Director of the Marine Biological Laboratory at Plymouth, he is under great obligation for placing the resources of that institution so freely at his service, and for much personal help and advice in the preparation of the article.

Through the exigencies of space it has been found necessary to adopt the following abbreviations in the lists of species, viz:—abund. denotes abundant; B. bay; c. common; dist. distribution, distributed; esp. especial, especially; f. c. fairly common; gen. general, generally; gnds. grounds; Harb. Harbour; h. t. high tide; h. w. high water; l. w. low water; n. c. not common; n. unc. not uncommon; occ. occasion, occasionally; r. rare; rr. very rare; S. Sound; spec. specimen; s. t. spring tide; t-m. tide-mark; var. variety, variation; v. c. very common; w-m. water-mark.

Among the names of authorities and recorders the following are indicated by initials, viz:—Couch, Jonathan = (J. C.); Couch, R. Quiller = (R. Q. C.); Hincks, S. = (H.); Marshall, J. T. = (M.); Marine Biological Association = (M. B. A.); Museum of the Royal Institution of Cornwall = (M. R. I.); Peach, C. W. = (P.); Smart and Cooke = (S. & C.); Vallentin, Rupert = (V.).

The records for which the writer is responsible are marked !

FORAMINIFERA

The following list of county foraminifera is based on the work of the Marine Biological Association at Plymouth, on a MS. list kindly furnished by Mr. F. W. Millett of the Foraminifera of Mount's Bay, on a similar list by Mr. E. Heron Allen of the species taken by him at Poljew Cove, Mullion, in 1892, and on work done by the Biological Department of the County Technical Schools at Truro. Where no authority is given for localities in the Plymouth district the records

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are taken from the *Journal of the Marine Biological Association*. Similarly Mr. Millett is the authority for the Mount's Bay records, Mr. Heron Allen for those from Mullion, and the Biological Department of the schools for all the others whose source is not acknowledged in the text. The writer takes the opportunity of expressing his indebtedness to Mr. Millett, Mr. Heron Allen, and Mr. R. H. Worth for generous assistance as unexpected as it was welcome.

1. *Gromia dujardini*, M. Schultze. Mud pools on the Fal, esp. Restronguet Creek; Helford
2. *G. oviformis*, Duj. Mud pools on the Fal; shallow water, St. Mawes
3. *Nubecularia lucifuga*, Defr. Falmouth Harb.; Mount's B.
4. *Biloculina ringens*, Lamk. Taken at intervals, chiefly in deep water, Cawsand B. to Mount's B.; occ. c. Porthcurnow; Scilly
5. *B. depressa*, d'Orb. Widely dist. but not abund.; Rame-Eddystone and Eddystone-Looe Gnds.; Gerran's B.; Maenporth; Poljew Cove, Mullion; Mount's B.; Hayle
6. *B. elongata*, d'Orb. Five m. W. $\frac{1}{2}$ S. from Rame; Falmouth B.; Mount's B.
7. *Spiroloculina planulata*, Lamk. F. plentiful Rame-Eddystone and Eddystone-Looe Gnds.; Polperro; Mount's B.; Padstow; Scilly
8. *S. limbata*, d'Orb. Rame-Eddystone and Eddystone-Looe Gnds.; Polperro; Gerran's B.; Falmouth; Mount's B.; in 40 fm. off Menavawr, Scilly
9. *S. tenuiseptata*, Brady. Occ. specs. Rame-Eddystone and Eddystone-Looe Gnds.
10. *S. excavata*, d'Orb. Gen. dist. Rame-Eddystone and Eddystone-Looe Gnds. r.; Falmouth B.; Poljew Cove, Mullion
11. *S. fragilissima*, Brady. Eastern slope of Hand Deep
12. *Miliolina trigonula*, Lamk. Rame-Eddystone and Eddystone-Looe Gnds. scarce; n. unc. Falmouth B.; Mount's B.; Poljew Cove, Mullion; Sennen Cove
13. *M. tricarinata*, d'Orb. Rame-Eddystone Gnds., unc.; Mount's B.; Porthcurnow
14. *M. oblonga*, Mont. C. in deep water along S. coast Rame-Eddystone Gnds. to Scilly; locally c. in shell sand
15. *M. semulinum*, L. Cawsand B.; Rame-Eddystone and Eddystone-Looe Gnds. c.; Polperro; on smaller fuci, corallines, etc., and from deepish water in Falmouth B.; Mount's B.; Poljew Cove, Mullion; St. Ives; Padstow and Scilly
16. *M. gracilis*, d'Orb. Poljew Cove, Mullion
17. *M. sclerotica*, Karrer. Mount's B.; Porthcurnow
18. *M. candeiana*, d'Orb. Mount's B.
19. *M. subrotunda*, Mont. C. and gen. dist. in shallow water and locally in 15 to 40 fm. Plymouth to Padstow; Scilly
20. *M. circularis*, Bornem. C. Rame-Eddystone Gnds.; a few specs. dredged in 30 fm. off Polperro; Poljew Cove, Mullion; Porthcurnow
21. *M. secans*, d'Orb. In shallower dredgings around Plymouth; Gerran's B.; Falmouth B.; Mount's B.
22. *M. bicornis*, Walker and Jacob. Gen. dist. throughout Plymouth district; Gerran's B.; Mount's B.; Poljew Cove, Mullion; and Scilly
23. *M. boueana*, d'Orb. Gen. about Plymouth; sparingly, Polperro
24. *M. pulchella*, d'Orb. Mount's B. and Porthcurnow
25. *M. ferussacii*, d'Orb. Eddystone (Spence Bate); Falmouth B.
26. *M. undosa*, Karret. Poljew Cove, Mullion
27. *M. agglutinans*, d'Orb. Rame-Eddystone and Eddystone-Looe Gnds. and everywhere in shallower water round Plymouth; c. in 15 to 20 fm. off Polperro; Gerran's B. and Falmouth B.
28. *Sigmoilina tenuis*, Czjzek. Mount's B.
29. *Cornuspira foliacea*, Philippi. Gen. but sparingly dist. Rame-Eddystone Gnds.; Eddystone-Looe, r.; scarce and local Falmouth B.; Mount's B.
30. *C. involvens*, Reuss. Gen. dist. and in some dredgings numbers found on hydroids, Rame-Eddystone and Eddystone-Looe Gnds.; scarce in 30 fm. off Polperro; trawl refuse, Helford; Mount's B. in shallow water and in 18 fm.
31. *Haliphysema tumanowiczii*, Bwbk. Abund. at times on Queen's Gnd., and sparingly in deeper dredgings in Plymouth district; abund. Falmouth in 1891 (V.) and 1902; Mount's B.; c. in shallow water, Pentle B., Scilly, 1904
32. *H. ramulosum*, Bwbk. Mount's B.; Scilly in 1890 (Bell)
33. *Reophax diffugiiformis*, Brady. Falmouth (Miss Vigurs); in 10 fm. off Gyllyngvase; Mount's B.
34. *R. findens* (?), Parker. Mount's B.
35. *R. scorpiurus*, Montfort. Once in 40 fm. off Maenporth; Mount's B.; St. Ives (R. Bell)
36. *Haplophragium canariense*, d'Orb. N. unc. and sometimes quite plentiful Rame-Eddystone and about Plymouth, but showing a preference for more silty areas; Polperro, scarce; n. unc. Falmouth Harb., Pennance, Helford; Mount's B.; St. Agnes
37. *H. fontinense*, Terquem. Near the Eddystone and possibly elsewhere on the outer Plymouth Gnds., but nowhere c.
38. *H. globigeriniforme*, Parker and Jones. In small numbers on Rame-Eddystone Gnds.; Mount's B.; once at Porthcurnow
39. *Placopsilina varians*, Carter. Mount's B.
40. *Ammodiscus incertus*, d'Orb. Rame-Eddystone, unc.; Fowey

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41. *Ammodiscus gordialis*, Parker and Jones. Rame-Eddystone, r.; off the Dodman; Mount's B.; Poljew Cove, Mullion
42. *Trochammina ochracea*, Will. Over the whole Plymouth area but n. c.; twice at Polperro
43. *T. squamata*, Parker and Jones. Mount's B.; Porthcurnow, r.
44. *T. plicata*, Terquem. Mount's B.
45. *T. inflata*, Mont. Dist. about Plymouth similar to that of *Haplophragmium canariense*, but found also well outside 30-fm. line; Looe; Falmouth Harb.; Helford; Mount's B.; Padstow
46. *T. marcescens*, Brady. A few specs. Whitsand B., Land's End
47. *T. nitida*, Brady. Poljew Cove, Mullion
48. *Textularia sagittula*, Defr. One of the less frequent of the arenaceous *Textulariae*, but widely spread in the Plymouth district; n. unc. and fairly typical at Falmouth; Mount's B.; Poljew Cove, Mullion
- [*T. trochus*, d'Orb. Worth is dubious about the identification of this species in the Plymouth area, 'always most suspiciously like a somewhat unorthodox *T. gramen*']
49. *T. agglutinans*, d'Orb. Gen. dist. in Plymouth area.
50. *T. gramen*, d'Orb. C. on S. coast and at Padstow; Newquay and Scilly
51. *Gaudryina filiformis*, Bert. Mount's B.
52. *Verneuilina polystropha*, Reuss. Drake's Is. and sparingly throughout Plymouth district; shallow water Polperro and Fowey; locally n. unc. Falmouth Harb.; Mount's B.; Padstow
53. *Bulimina pupoides*, d'Orb. C. on S. coast down to 40 fm.; Newquay; Padstow
54. *B. ovata*, d'Orb. Mount's B.; Sennen Cove; Whitsand B., Land's End
55. *B. marginata*, d'Orb. N. unc. on S. coast; Scilly
56. *B. aculeata*, d'Orb. C. on S. and at intervals along N. coast
57. *B. elegans*, d'Orb. Occurs sparingly throughout Plymouth district; Falmouth r. Var. *exilis*, Brady. $4\frac{1}{2}$ m. W. $\frac{1}{2}$ S. and 5 m. W. $\frac{1}{4}$ S. from Rame
58. *B. elegantissima*, d'Orb. Gen. dist. Plymouth to Helford; Mount's B.; Sennen Cove
59. *Virgulina schreibersiana*, Czjzek. C. in Plymouth district; Polperro; Pendower; Helford; Mount's B.
60. *V. subdepressa*, Brady. Poljew Cove, Mullion
61. *Bolivina punctata*, d'Orb. Widely dist. but local round the coast; c. in places
62. *B. plicata*, d'Orb. Mount's B.
63. *B. textularoides*, Reuss. N. unc. round SE. coast, but scarce about Falmouth; Poljew Cove, Mullion
64. *B. difformis*, Will. Irregularly dist. and usually scarce Plymouth to Whitsand B., Land's End
65. *Bolivina nitida*, Brady. Poljew Cove, Mullion; Mount's B.; Porthcurnow
66. *B. dilatata*, Reuss. Gen. throughout Plymouth district; c. Fowey, Falmouth, Penzance and Helford; Poljew Cove, Mullion
67. *B. aenariensis*, Costa. F. c. Plymouth area and near Fowey; Falmouth
68. *Cassidulina crassa*, d'Orb. F. c. Plymouth district; c. near Polperro; Pendower; Gyllyngvase and Mount's B.; once at Helford
69. *C. Bradyi*, Norman. Evidently gen. dist. and n. unc. Plymouth to Mevagissey; not found further W.
70. *Lagena globosa*, Mont. Gen. round coast and at Scilly; var. *striata*, Will. Eddystone (Spence Bate)
71. *L. apiculata*, Reuss. R. in Plymouth district; a few obtained in Falmouth B.
72. *L. botelliformis*, Brady. N. unc. in SE.; once at Gorran
73. *L. laevis*, Mont. Widely spread along S. coast, and often c.; var. *pellucida*, Will. Eddystone (Spence Bate)
74. *L. clavata*, d'Orb. Gen. dist. Plymouth S. to Coverack, but usually somewhat scarce; Mount's B.; Scilly.
75. *L. gracillima*, Seguenza. Widespread along S. coast but erratic in dist. and seldom plentiful
76. *L. lyelli*, Seguenza. Mount's B.
77. *L. aspera*, Reuss. R. and local but with a preference for the shallower waters, Plymouth; Falmouth, Helford, Mount's B.
78. *L. hispida*, Reuss. R. in Plymouth district; Polperro
79. *L. lineata*, Will. N. unc. Rame-Eddystone and Eddystone Gnds.; r. Falmouth; Mount's B.
80. *L. distoma*, Parker & Jones. Gen. dist. in small numbers in the Plymouth area
81. *L. sulcata*, Walker & Jacobs. F. c. along S. coast and at Scilly
82. *L. acuticosta*, Reuss. Poljew Cove, Mullion
83. *L. williamsoni*, Alcock. Mount's B.; Sennen.
84. *L. costata*, Will. Mount's B.
85. *L. striata*, d'Orb. F. c. and locally abund. along S. coast
86. *L. curvilineata*, Balkwill & Wright. Mount's B.
87. *L. semistriata*, Will. C. locally along S. coast and at Scilly
88. *L. gracilis*, Will. Gen. dist. around Plymouth; Falmouth; Poljew Cove, Mullion, r.
89. *L. squamosa*, Mont. C. along S. coast; Padstow
90. *L. melo*, d'Orb. Mount's B.; Sennen.
91. *L. hexagona*, Will. Somewhat irregularly dist. but locally plentiful on S. coast.
92. *L. laevigata*, Reuss. Mount's B.; Sennen
93. *L. lucida*, Will. Mount's B.; near Land's End
94. *L. acuta*, Reuss. Mount's B.
95. *L. trigono-oblonga*, Seg & Sid. Mount's B.

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96. *Lagena marginata*, Walker & Boys. Gen. dist. and c. in Plymouth area, and at Falmouth ; Mount's B. ; local at Scilly ; small forms sometimes difficult to discriminate from *L. orbignyana* ; var. *ornata*, Will. About Plymouth, r.
97. *L. trigono-elliptica*, Balkwill & Millett. Mount's B.
98. *L. trigono-marginata*, Parker & Jones. Single specs. n. infrequent in sand dredged from Rame-Eddystone Gnds. ; Mount's B.
99. *L. quadrata*, Will. Present everywhere in small numbers in the Plymouth area ; n. unc. locally Falmouth B. ; Helford, and Mount's B. ; var. *semi-alata*, Balkwill & Millett. Mount's B.
100. *L. faba*, Balkwill & Millett. Mount's B.
101. *L. orbignyana*, Seg. C. along S. coast, at Scilly and Padstow
102. *L. lagenoides*, Will. Gen. dist. along S. coast ; Scilly and Padstow ; var. *tenuistriata*, Brady. Mount's B.
103. *Nodosaria radícula*, Mont. Sennen and Whitsand B., Land's End
104. *N. pyrula*, d'Orb. Gen. dist. but scarce about Plymouth ; Pendower, after a storm ; Mount's B.
105. *N. communis*, d'Orb. Evidently widely dist. in deepish water Plymouth district ; Polperro ; Fowey ; Falmouth ; Helford ; Mount's B.
106. *N. jugosa*, Mont. Falmouth B., r. ; only a slightly costate var. of *N. communis*
107. *N. mucronata*, Neugeb. Mount's B.
108. *N. scalaris*, Batsch. Gen. dist. in the Plymouth district but scarce in places ; Mount's B.
109. *N. obliqua*, L. Falmouth, from laminarian zone down to 35 fm. n. c. ; Mount's B.
110. *N. calomorpha*, Reuss. N. unc. Plymouth district ; small and probably overlooked elsewhere
111. *Lingulina carinata*, d'Orb. Found in Plymouth S. by Spence Bate.
112. *Vaginulina legumen*, L. From some shore scrapings, Lelant (Bell)
113. *Cristellaria crepidula*, Fichtel & Moll. Gen. dist. and f. c. as far W. as Falmouth ; Mount's B. ; a few at Scilly
114. *C. rotulata* Lamk. C. on S. coast ; Scilly
115. *C. vortex*, Fichtel & Moll. Occ. specs. found in Plymouth district.
116. *C. italica*, DeFr. Gen. dist. around Plymouth but scarce ; Scilly (Bell)
117. *Amphicoryne falx*, Jones & Parker. Plymouth district, r.
118. *Polymorphina lactea*, Walker & Jacobs
P. gibba, d'Orb.
 Gen. dist. and n. unc. along S. coast and at Scilly ; local on N.
119. *P. aequalis*, d'Orb. Mount's B. ; Sennen
120. *P. communis*, d'Orb. Poljew Cove, Mullion
121. *P. orbignyii*, Zbor. Mount's B. ; Lelant (Bell)
122. *P. oblonga*, Will. Drake's Is., occ. specs. Rame-Eddystone Gnds. ; r. near Helford ; Mount's B. ; n. unc. on *Zostera*, Scilly
123. *Polymorphina compressa*, d'Orb. Drake's Is. ; occ. elsewhere in Plymouth district ; f. c. Falmouth ; Mount's B.
124. *P. concava*, Will. Mount's B. ; Sennen
125. *P. myristiformis*, Will. Mount's B. ; Whitsand B., Land's End
126. *Uvigerina angulosa*, Will. Gen. dist. but n. c. along S. coast and at Scilly
127. *U. pygmaea*, d'Orb. Porthcurnow
128. *Sagrina raphanus*, Parker & Jones. Poljew Cove, Mullion ; Whitsand B., Land's End
129. *Globigerina bulloides*, d'Orb. Gen. dist. Plymouth district ; abund. Polperro ; widely spread, Falmouth B. ; Mount's B. ; Scilly
130. *G. inflata*, d'Orb. An occ. spec. in Plymouth district ; Mount's B.
131. *Orbulina universa*, d'Orb. An occ. spec. in Plymouth district
132. *Pullenia sphaeroides*, d'Orb. Whitsand B., Land's End
133. *Sphaeroidina debiscens*, Parker & Jones. Around Plymouth, r.
134. *Spirillina vivipara*, Ehrenb. Drake's Is. ; gen. on the Rame-Eddystone Gnds., but n. c. ; widely spread Falmouth and Helford ; Poljew Cove, Mullion ; Mount's B. ; Sennen
135. *S. margaritifera*, Will. An occ. spec. on the Rame-Eddystone Gnds. ; Mount's B.
136. *S. tuberculata*, Brady. Whitsand B., Land's End
137. *Patellina corrugata*, Will. Widely dist. but apparently local along the S. coast
138. *Discorbina globularis*, d'Orb. Gen. dist. along S. coast ; occ. abund. on *Zostera*, Scilly
139. *D. rosacea*, d'Orb. C. along S. and locally on N. coast
140. *D. orbicularis*, Terquem. Gen. dist. and locally plentiful, Plymouth to Scilly
141. *D. parisiensis*, d'Orb. Cawsand B. and sparingly represented in most dredgings in Plymouth area though in some places apparently scarce ; Polperro ; widely dist. but n. c. in Falmouth B. ; Mount's B.
142. *D. bertheloti*, d'Orb. Occurrence about Plymouth similar to *D. parisiensis* ; Whitsand B., Looe (Marryat) ; Falmouth B., r.
143. *D. vesicularis*, Lamk. Poljew Cove, Mullion
144. *Planorbulina mediterraneensis*, d'Orb. Gen. dist. along the S. coast and at Scilly ; locally abund. Padstow
145. *P. acervalis*, Brady. Poljew Cove, Mullion
146. *Truncatulina refulgens*, Montf. Poljew Cove ; Land's End (Bell)
147. *T. lobatula*, Walker & Jacob. Abund. along S. coast and at Scilly wherever hydroids are plentiful
148. *T. depressa*, d'Orb. Poljew Cove, Mullion
149. *T. variabilis*, d'Orb. Falmouth B., scarce ; Poljew Cove ; Sennen

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150. *Pulvinulina repanda*, Fichtel & Moll. Cawsand B. and gen. dist, but n. abund. in Plymouth district
151. *P. menardii*, d'Orb. Probably only a casual in Plymouth district
152. *P. auricula*, Fichtel & Moll. Mount's B.
153. *P. elegans*. Poljew Cove ; Sennen ; Whitsand B., Land's End
154. *P. pauperata*, Parker & Jones. Poljew Cove ; in 40 fm. off Menawawr, Scilly
155. *P. exigua*, Brady. Poljew Cove, Mullion ; Porthcurnow
156. *Rotalia beccari*, Lamk. Gen. dist. along S. coast and at Scilly, on fine sand abund. ; Newquay and Padstow
157. *R. nitida*, Will. C. and gen. dist. along S. ; Scilly and Padstow
158. *Gypsina inbaerans*, Schul. Poljew Cove ; Mount's B.
159. *Nonionina depressula*, Walker & Jacob. C. everywhere round coast and at Scilly
160. *Nonionina umbilicatulæ*, Mont. Widely spread along S. but n. c. ; Scilly and Camel Estuary
161. *N. turgida*, Will. Gen. spread throughout Plymouth district, n. abund. ; Falmouth B. ; Mount's B. ; Sennen
162. *N. scapha*, Fichtel and Moll. Occurrence in Plymouth district similar to *N. turgida* ; Falmouth B. ; Poljew Cove, Mullion
163. *N. stelligera*, d'Orb. Gen. dist. along S. but r. in places ; Whitsand B., Land's End
164. *Polystomella crispa*, Lamk. Gen. dist. in Plymouth district within the 15-fm. line, but below 20 fm. almost unknown ; evidently abund. at least locally around coast ; Scilly
165. *P. subnudosa*, Münster. N. infrequent around Plymouth outside 28 fm.
166. *P. macella*, Fichtel & Moll. Widely spread in Plymouth district ; Falmouth ; Padstow
167. *P. striato-punctata*, Fichtel & Moll. Cawsand B., Drake's Is. ; c. along S. coast ; Scilly
168. *P. arctica*, Parker & Jones. Throughout the Plymouth district, but n. abund.
169. *Operculina ammonoides*, Gron. Poljew Cove, Mullion.

PORIFERA

The serious difficulties attending the satisfactory identification of many of the sponges have resulted in the accompanying list becoming in places a mere compilation. Large quantities of material from Polperro, off the Dodman, and from Falmouth Bay have been examined from time to time, but the rigorous exclusion of all records where there was any uncertainty as to the identification has made the list in places simply an enumeration of the county specimens mentioned by Bowerbank in his monograph. The classification and nomenclature is that given by Dr. R. Hanitsch in his 'Revision of the generic nomenclature and classification in Bowerbank's Spongiadae,' (*Proc. Liverpool Biol. Soc.* viii).

1. *Leucosolenia botryoides*, E. & S. Gen. dist. round the coast and in places abund., esp. on seaweeds between t-m. ; Scilly !
2. *L. complicata*, Montagu. Locally c. on S. coast in rock-pools and occ. down to 20 fm. ; St. Ives ; Perranporth ! Newquay ! Widemouth B. !
3. *L. variabilis*, Haeckel. C. in rock-pools all round coast and locally at Scilly
4. *Clathrina coriacea*, Fleming. N. unc. on rocks and stones between t-m. along S. coast ; Chapel Porth ! Padstow ! Scilly !
5. *C. lacunosa*, Johnst. Occurs at 30 fm. or more on the Rame-Eddystone Gnds., off the Dodman and in Mount's B.
6. *Sycon compressum*, Flem. C. on rocky ground at l. w. along S. coast and locally abund. on N. coast and at Scilly
7. *S. coronatum*, E. & S. N. unc. round coast and at Scilly on rocks at l. t.
8. *Sycandra ciliata*, O. Fab. } All three found off Cornish Coast by Rev. Canon Norman
9. *S. compressa*, O. Fab. }
10. *Leucandra Gossei*, B. }
11. *Leucandra fistulosa*, Johnst. Found off the Eddy-stone by J. H. Stewart
12. *L. Johnstonii*, Carter. Found off Polperro by Laughlin
13. *L. nivea*, Grant. On rocks and stones at l.w., Falmouth ; on laminarian roots, Mount's B.
14. *Halisarca dujardini*, Johnst. Mevagissey, 1902, on the roots of *Laminaria* !
15. *Craniella cranium*, Lamarck. On a stone in trawl refuse at Falmouth, 1901 !
16. *Pachymatisma johnstonii*, B. Gorran Haven, Porthloe and Mount's B. !
17. *Chalina cervicornis*, Pallas. Occ. at Fowey, in Falmouth B. (Cocks), once at Whitsand B. Land's End (Baily) and sent in from N. coast
18. *C. oculata*, Pallas. N. unc. along the S. coast and occ. on N. ; at times f. c. in Falmouth B.
19. *Pachychalina limbata*, Mont. A spec. obtained by Peach on a *Terebratula* at Fowey.
20. *Halichondria albescens*, Johnst. Cast up occ. in some quantity along coast after a storm on laminarian roots, *Sertularia*, &c.

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21. *Halichondria fallaciosa* B. Collected by Peach in Fowey Harb.
22. *H. panicea*, Pallas. C. all round coast esp. after a storm; Scilly
23. *Reniera cinerea*, Grant. At v. l. w. at Fowey (Peach) and Falmouth (Cocks)
24. *R. densa*, B. Type spec. obtained by Norman at Fowey
25. *R. indistincta*, B. Collected by Peach in Fowey Harb.
26. *R. MacAndrewi*, B. Found by Norman at Polperro
27. *Gellius couchi*, B. Type spec. obtained by Jonathan Couch on Cornish coast
28. *Stylotella incognita*, B. Type spec. collected by Peach at Fowey
- [*Esperiopsis funalis*, B. One spec. on the Atlantic cable 150 m. from Land's End in 200 fm.]
29. *E. Alderi*, B. Obtained by Bowerbank at Mill B. near Land's End
30. *E. fucorum*, Johnst. In pools between t-m. along coast on *Sertulariae*; Scilly
31. *Esperella aegagrophila*, Johnst. Collected by Bowerbank on Cornish coast
32. *Desmacidon fruticosum*, Mont. Obtained by Peach at Fowey
33. *Homaeodictyon palmata*, Johnst. In trawl refuse at Penzance; occ. cast up in Falmouth B. after a storm
34. *Dendoryx incrustans*, Esper. N. unc. along coast on rocks at l. w.; Scilly
35. *D. Dickiei*, B. Collected by Norman at Polperro
36. *Lissomyxilla spinosa*, B. Type spec. obtained by Peach at Fowey; collected by Bowerbank in Mount's B.
37. *Stylotichon plumosum*, Mont. Collected by Bowerbank at Sennen Cove.
38. *Microciona carnosa*, B. Found at Sennen Cove by Bowerbank, at Polperro by Norman; Falmouth!
39. *M. atrasanguinea*, B. Found by Bowerbank at Sennen Cove
40. *Raspailia hispida*, Mont. N. unc. in trawl refuse at Falmouth and Penzance; obtained by Couch and Norman at Polperro
41. *Raspailia pumila*, B. Collected by Peach at Fowey; Zennor!
42. *R. ramosa*, Mont. Found at Polperro by Norman
43. *Ophlitaspongia seriata*, Grant. Found at Fowey by Peach, at Falmouth by Norman; Padstow, surrounding the stems of *Laminaria*!
44. *Hymeniacion carunculum*, B. Obtained by Bowerbank at Mill B. near Land's End
45. *H. invalidum*, B. Type spec. obtained by C. Stewart off Rame Hd.; Mount's B. (Baily)
46. *H. medium*, B. Type spec. obtained by C. Stewart at Plymouth; dredged by Burkill at Scilly
47. *H. sanguineum*, Grant. N. unc. locally along the coast, Rame Hd. to Mount's B.; Zennor!
48. *H. viridans*, B. Found by C. Stewart coating small boulders at Plymouth (B.)
49. *Tragosia infundibuliformis*, Flem. Found by Cocks on a stone in trawl refuse at Falmouth; Mount's B. (Baily); Eddystone-Looe Gnds. (M.B.A.)
50. *Tragosia polypodioides*, O. Schmidt. One spec. obtained near Laregan Rks. Mount's B. and identified by Bowerbank (Baily)
51. *Suberites carnosus*, Johnst. Found by J. H. Stewart at Plymouth (B.)
52. *S. domuncula*, Olivi. N. unc. along S. coast; Zennor, Newquay, and Scilly!
53. *S. ficus*, Esper. N. unc. on dead shells in trawl refuse along S. coast
54. *S. virgulosus*, Johnst. Obtained on Cornish coast by Jonathan Couch (B.)
55. *Polymastia mammillaris*, Müll. Polperro (B); occ. Falmouth B.!
56. *Clione celata*, Grant. First found on Cornish coast by Beach (B); occ. cast up at Falmouth after a storm; Eddystone Gnds. and Rame-Eddystone Gnds. (M.B.A.)
57. *Tethya Lyncurium*, Linn. Occ. on rocks at l. s. t. on S. coast and at Whitsand B., Land's End.
58. *Leiosella pulchella*, Sow. Attached to hydroids from deep water; Falmouth and Mount's B.
59. *Spongelia fragilis*, M. Var. *irregularis* n. unc. round coast.

HYDROIDS

The principal contributors to our knowledge of the county representatives of this fascinating group have been R. Q. Couch, Peach, Cocks, and Hincks. The observations of the first-named are recorded at some length in (Jonathan) Couch's *Cornish Fauna*, pt. 2 (1841); Peach published his notes in the *Journal of the Royal Institution of Cornwall* (1849 and 1878); while those of Cocks appeared in his 'Cornish Fauna' (*Seventeenth Ann. Rep. Roy. Cornw. Polyt. Soc.* 1849). From the time of Peach's last paper the group has been somewhat neglected, but of recent years Vallentin has paid some attention to the species of the Falmouth district. E. T. Browne has published some observations on the occurrence of Medusa stages at Scilly, and excellent work has been done around Plymouth.

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A. ANTHOMEDUSAE

(Hydroid Stage)

1. *Clava multicornis*, Forskal. C. between t-m. and esp. in rock-pools on stones, dead shells, *fuci*, &c. all along S. coast and locally on N.; Scilly
2. *C. squamata*, Müll. Drake's Is., Barnpool and St. Germans river (M.B.A.); near l. w. Polperro and Mevagissey; sparingly between t-m. on *Fucus vesiculosus*, Falmouth and St. Michael's Mt.; n. unc. at Scilly
3. *C. leptostyla*, Agassiz. Under the Hoe at Plymouth (M.B.A.) and in Barnpool (Woodward)
4. *Tubiclava lucerna*, Allman. Millbay Chan. (M.B.A.); on stones in a rock pool S. of Mevagissey!
5. *Merona cornucopiae*, Norman. N. unc. along the S. coast in 15 to 60 fm. on shells of *Aporrhais*, *Dentalium*, *Turritella* (M.B.A.), *Buccinum*, *Tritonofusus*, *Ocenebra*, *Mangilia* and *Nassa* tenanted by *Phascolion strombi*, and on living *Dentalium* and *Venus fasciata*
6. *Turris neglecta*, Lesson. The bright coral-red gonozooids have been observed at Bude
7. *Hydractinia ecbinata*, Fleming. Gen. dist. and f. c. on S. coast, ranging from l. w-m. down to 40 fm. on shells of *Buccinum*, *Tritonofusus*, *Nassa reticulata* and *N. incrassata*, *Gibbula magus*, *Calliostoma zizyphinus* &c., inhabited by *Eupagurus bernhardus*; occ. taken on living *Buccinum* (M.B.A.); at times on N. coast; n. unc. at Scilly
8. *Podocoryne carnea*, M. Sars. N. unc. along S. coast and at Scilly in shallow water, esp. on the shells of *Nassa reticulata* and *N. incrassata*; occ. on N. coast; in Cawsand B., small colonies c. on living *N. reticulata* (M.B.A.); medusae at Penlee Pt. 9 July, 1902; n. unc. at Scilly
9. *Lar sabellarum*, Gosse. Millbay Chan. (M.B.A.), and near Mevagissey on Sabellid tubes; also on *Potamilla torelli* (M.B.A.); Falmouth B., r.!
10. *Coryne pusilla*, Gaertner. N. unc. lately about Falmouth on *Ceramium rubrum*, and esp. among the roots of *Laminaria*!
11. *C. vaginata*, Hincks. C. and gen. dist. in rock-pools lined with algae near l. w-m. all round coast; Scilly
12. *C. fruticosa*, Hincks. Polperro; Gorran Haven (Peach); on *fuci*, Mount's B. (Hincks)
13. *Syncoryne eximia*, Allman. Off Penlee Pt., Sept. 1897 (M.B.A.)
14. *S. gravata*, T. S. Wright. Drake's Is.; Mt. Edgumbe (M.B.A.); on stones in a rock-pool Polperro!
15. *Zanclaea implexa*, Alder. A single colony on an encrusting polyzoan dredged from rocky ground between Penlee Pt. and Rame Hd. (M.B.A.)
16. *Cladonema radiatum*, Dujardin. Gonozooids f. c. at Falmouth in summer, polypites never seen (V.)
17. *Stauridium productum*, Wright. In rock-pools E. of Newquay, in places c.!
18. *Clavatella prolifera*, Hincks. Gonozooids c. in summer at Falmouth, polypites never found (V.)
19. *Myriothela phrygia*. C. under stones at l. t., Drake's Is., Mt. Edgumbe, Rame Hd.; also on Asia shoal (M.B.A.); n. unc. at l. s. t. Polperro and Mevagissey! scarce Falmouth; Mousehole
20. *Eudendrium rameum*, Pallas. In 30 fm. at the Eddystone, n. unc. (M.B.A.); in 25 fm. off Polperro; in 60 fm. off the Dodman (R.Q.C.); f. c. on shells and *Sertularia* from trawl refuse at Falmouth and Helford; on a valve of *Pinna* at Scilly
21. *E. ramosum*, L. F. c. but irregularly dist. along S. coast from l. w. down to 60 fm., gen. on shells, often on roots of *Sertularia*, *Antennularia*, &c.; Widemouth B. near Bude, after a storm!
22. *E. capillare*, Alder. On *Antennularia* and other hydroids, on *Delesseria sanguinea* and other seaweeds and occ. on tubes of Annelids—once on *Thelepus concinnatus*; Eddystone Gnds. (M.B.A.); Polperro (Hincks) and Mevagissey! n. unc. locally in 30 fm. Falmouth B.; in shallow water, Helford!
23. *E. insigne*, Hincks. In a shallow rock-pool close to the Black Rk., Widemouth B.!
24. *E. album*, Nutting. Abund. about Plymouth in spring (M.B.A.); Polperro and occ. Mevagissey!
25. *Perigonimus repens*, T. S. Wright. From shallow water to 40 fm. on living *Nassa reticulata* and also on dead shells; on *Dentalium*; on *Turritella*, both living and dead; outside and inside *Buccinum* shells; on *Sertulariae* and on *Antennularia*; on the abdomen of *Carcinus*, the claw of *Eupagurus bernhardus*, on the back of *Stenorrhynchus*, and of *Maia squinado*; on stones and on clinkers; nowhere c., but evidently gen. dist. along S. coast
26. *Perigonimus serpens*, Allman. On Eddystone buoy, 1898 (M.B.A.)
27. *Hydranthea margarica*, Hincks. On *Flustra foliacea* in Widemouth B.!
28. *Garveia nutans*, T. S. Wright. At several stations in Plymouth S. (M.B.A.); Fowey (Martyn); Mevagissey!
29. *Bimeria vestita*, T. S. Wright. On *Delesseria sanguinea* l. s. t., Polperro; on *Antennularia* and on *fuci* near Helford!
30. *Heterocordyle conybearei*, Allman. Abund. Plymouth S., on living *Nassa reticulata*, and frequently also on dead shells (M.B.A.); n. unc. locally in dredgings and trawl refuse along the S. coast on *Buccinum*, *Turritella* and *Natica* inhabited by *Eupagurus bernhardus*; occ. on living *Nassa reticulata* at Helford!
31. *Bougainvillea ramosa*, van Beneden. N. unc. about Plymouth S., on Polychaete tubes and other hydroids, Eddystone Gnds. (M.B.A.); at l. s. t., Polperro! and in trawl refuse Mevagissey! brought in on a stone from 60 fm. off the Dodman!

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32. *Tubularia indivisa*, Linn. F. c. about Plymouth S. (M.B.A.); Whitsand B.; c. on stones from 30 fm. off Polperro! in rock-pools near l. w., Mevagissey! Gorran Haven on rocks at l. s. t. in trawl refuse on cork floats, timber and ships' bottoms, Falmouth (Cocks); c. locally in deep water, Falmouth B., and on the Manacles! Mount's B.; Newquay and Widemouth B.! St. Mary's S., Scilly (R.Q.C.) and on the beach at Annett!
33. *T. larynx*, E. & S. Abund. on buoys in Plymouth S. (M.B.A.); on algae and stones at l. s. t. Polperro! in trawl refuse and on cork floats, Mevagissey! on a valve of *Pinna* from 60 fm. off the Dodman! c. locally in Falmouth B., 5 to 30 fm.! Widemouth B.! Scilly, n. unc.
34. *T. coronata*, Abilgaard. R. Fowey (Peach); in trawl refuse on shells and sponges, Mevagissey! Falmouth, r.; occ. on shells and *Sertulariae*, Helford!
35. *T. humilis*, Allman. In tide pools below the Hoe and in Barn pool, Plymouth (M.B.A.)
36. *Corymorpha nutans*, M. Sars. The hydroid generation decidedly scarce, though the medusa is c.; three spec. at Fowey (Peach), five in 3 fm. off Fort Tregantle May, 1887, one on Queen's Gnd. and one in Cawsand B. June, 1904 (M.B.A.); one in 12 fm. off Helford, May, 1900! and one in St. Ives B. 1905 (V.)

(Medusa Stage)

1. *Sarsia eximia*, Allman. Plymouth district, some specs. July
2. *S. gemmifera*, Forbes. About Plymouth, occ. in May, June, July, and Sept.; at Falmouth usually in June and July; some years abund. in harb. (V.); Scilly
3. *S. prolifera*, Forbes. About a hundred in Whitsand B., E., May, 1896, and v. abund. off Rame Hd. July, 1899; Penzance (Forbes and Peach); often abund. at Falmouth 'in immense profusion in sheltered places in the harbour,' May, 1899 (V.)
4. *S. tubulosa*, Sars. Occ. in Plymouth S. May; Saltash Bridge, May, 1898; Falmouth, most years in May; taken by Heron Allen at Penzance
5. *S. pulchella*, Haeckel. Three specs. at Falmouth June, 1893 (V.)
6. *Ectopleura dumortieri*, L. Agassiz. One spec. Plymouth S.
7. *Dipurena balterata*, Forbes. Occ. about Plymouth; Gyllyngvase, 1836 (Cocks); found by Forbes in Mount's B., and by Browne at Scilly
8. *D. obbiogaster*, Haeckel. One spec. Plymouth, July, 1897
9. *Steenstrupia rubra*, Forbes. Abund. spring and early summer, Plymouth district; v. c. Falmouth Harb. April, 1902! Mount's B. (Peach); c. Scilly April, 1903!
10. *S. flaveola*, Forbes. Found by Forbes in Mount's B.
11. *Hybocodon prolifer*, Agassiz. N. unc. about Plymouth April, 1898; a few specs. with numerous buds April, 1894; taken at Scilly by Browne, May, 1903
12. *Euphysa aurata*, Forbes. A single spec. 4 m. S. of Plymouth Breakwater, Sept. 1897; a few around Plymouth April to June, 1898; taken at Scilly by Browne, July, 1899, and May, 1903
13. *Amphineura dinema*, Peron and Lesueur. F. c. about Plymouth Sept. 1893, scarce, 1895 and 1897; odd specs. May and June, c. July, 1899: f. c. Scilly July, 1899, mostly adult specs. with ripe gonads (Browne)
14. *Perigonimus repens*, T. S. Wright. Plymouth; specs. of *Perigonimus* taken by Browne at Scilly, April-May, 1903, but too young for determination
15. *Tiara pileata*, A. Agassiz. Occ. specs. Plymouth district; 4 taken at the mouth of Falmouth Harb. June, 1902! 1 spec. taken by Browne at Scilly, July, 1899
16. *T. octona*, Forbes. Once at Falmouth in 1895, abund. May, 1899 (V.); Gyllyngvase and Maenporth (Cocks); Mount's B. (Forbes)
17. *Lizzia blondina*, Forbes. Occ. in large shoals Plymouth district, at times very scarce; abund. Falmouth B. and Harb. Sept. 1902! found by Peach in Mount's B.; f. c. Scilly July, 1899 (Browne), and Aug., 1902!
18. *Podocoryne carnea*, Sars. Plymouth district, March, July, and Aug.
19. *Cytaeandra areolata*, Haeckel. Intermediate stages occ. found around Plymouth, Sept. 1897
20. *Margelis autumnalis*, C. Hartlaub. Scarce about Plymouth, Sept. 1897, and 1898; a few adults at Scilly July, 1899 (Browne)
21. *M. bella*, Hartlaub. A young stage at Plymouth in May and 4 in June, 1898
22. *M. britannica*, Forbes. End of April, Plymouth district; taken at Falmouth, 1 May, 1900 (V.)
23. *M. principis*, Steenstrup. End of April, Plymouth district
24. *M. octopunctatum*, Sars. Numerous specs. Plymouth district latter half of Feb. and March, 1893, less abund. 1894, scarce April and May, 1898; c. some years at Falmouth, May and June; abund. 1901! found by Peach in Mount's B.; one spec. with medusa buds at Scilly May, 1903 (Browne)
25. *Gemmaria implexa*, Alder. Two specs. Plymouth Aug. 1895, one Cawsand B. Sept. 1897; f. c. Scilly July, 1899, chiefly adults with ripe gonads (Browne)
26. *Willia stellata*, Forbes. Evidently scarce Plymouth district, obtained there from May to Sept.; Falmouth in June, July, and Aug.; taken by Peach and by Forbes in Penzance B.; f. c. the third week of May, and in early July, 1903, at Scilly!

B. LEPTOMEDUSAE

(Hydroid Stage)

1. *Clytia Johnstoni*, Alder. C. all round the coast and locally abund. on algae, *Zostera*, hydroids and antennae of crabs from near l. w. down to 60 fm.; several times off the Dodman on a valve of *Pinna*; c. Scilly

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2. *Obelia dichotoma*, Linn. C. along S. coast and at Scilly on hydroids, stones, worm-tubes, polyzoa, and occ. on valves of *Pecten*, *Pinna* and *Cyprina* from l. w. down to 40 fm.; Padstow and Widemouth B.!
3. *O. geniculata*, Linn. V. c. along S. coast and locally at Scilly on *Laminaria*, *Fuci*, *Delessaria*, wooden piles, and occ. on other algae, *Cellaria*, crustacea, dorsal and caudal fins of Pickin dogfish (R.Q.C.), stones, &c., from l. w. to 30 fm.; probably overlooked on N. coast.
4. *O. longissima*, Pallas. N. unc. locally in trawl refuse and in dredgings from 20 to 35 fm.; S. of the Eddystone (M.B.A.); Looe, Polperro, Mevagissey! Gorran Haven (Peach); in 30 fm. Falmouth B.!
5. *Obelaria gelatinosa*, Pallas. Large colonies up to 13 in. in deep water, Lynher river, under Sheviok Wood (M.B.A.); in 30 fm. off Polperro and in trawl refuse Mevagissey!
6. *Campanularia volubilis*, Linn. Plentiful in 5½ fm. N. of Plymouth Breakwater (M.B.A.)
7. *C. bincksi*, Alder. C. Rame-Eddystone and Eddystone Gnds. (M.B.A.); in trawl refuse Mevagissey!
8. *C. integra*, Macgillivray. On a stone from deep water off the Dodman. Hincks suggests that the *C. laevis* of Couch may be this species
9. *C. verticillata*, Linn. Eddystone Gnds. (M.B.A.); once in trawl refuse Mevagissey! on *Pinna* off the Dodman (R.Q.C.); twice in trawl refuse Falmouth
10. *C. flexuosa*, Hincks. C. all round the coast on stones, seaweed, buoys, &c., and in pools gen. between t.-m.; often abund. Scilly!
11. *C. angulata*, Hincks. On *Zostera* at Helford!
12. *C. neglecta*, Alder. Apparently n. unc. locally along S. coast, but gen. overlooked; on hydroids and under stones between t.-m.; Whitsand B. (Robinson), near Mevagissey! Helford! and Mount's B. (Baily)
13. *C. raridentata*, Alder. Gorran Haven (Peach); trawl refuse, Falmouth B.!
14. *Gonothyræa loveni*, Allman. C. Plymouth S. and found up the Tamar as far as Saltash Pier (M.B.A.); on *Fucus* occ. at Polperro at l. s. t., on the bar at Helford and for some distance up the river!
15. *Campanulina repens*, Allman. Between Penlee Pt. and Rame Hd. on algae and on stems of *Tubularia* (M.B.A.); in shallow water, Polperro B.; on *Delessaria* between Gyllyngvase and Swanpool, Falmouth!
16. *Opercularella hispida*, Nutting. The type spec. from Plymouth on a stone associated with *Clava multicornis* (M.B.A.)
17. *O. lacerata*, Johnst. N. unc. between t.-m. St. Ives (Hincks)
18. *Lafôea dumosa*, Fleming. C. round coast and at Scilly on stones, shells, corallines, hydroids, worm-tubes; occ. on polyzoa in trawl refuse and in dredgings from shallow water to 40 fm.; sometimes c. between t.-m. var. *robusta*, Sars, off the Cornish coast (Hincks)
19. *L. fruticosa*, M. Sars. Rame-Eddystone and Eddystone Gnds. (M.B.A.); on dead shells and hydroids in trawl refuse, Mevagissey
20. *Calycella syringa*, Linn. C. and occ. abund. along S. coast on corallines and small algae gen., on laminarian roots, *Tubularia* and other hydroids, polyzoa, crustacea, &c., from between t.-m. down to 20 fm.; Padstow B. and Scilly
21. *C. fastigiata*, Alder. Eddystone Gnds. (M.B.A.); on *Plumularia tubulifera* from Cornwall (Hincks); Mount's B.!
22. *Cuspidella costata*, Hincks. Inner Eddystone trawling Gnds. (M.B.A.); Looe (Marryat)
23. *C. grandis*, Hincks. On stems of *Halecium tenellum* (M.B.A.); on stems of various hydroids, Fowey (Martynt)
24. *Filellum serpens*, Hassall. On large *Sertulariidae* and esp. *S. abietina*, c. in 30 fm. off Polperro! in trawl refuse, Mevagissey! and at Gorran Haven (Peach)
25. *Trichydra pudica*, T. S. Wright. On fine gravel, Eddystone Gnds.; the Eddystone buoy (M.B.A.)
26. *Coppinia arcta*, Dalyell. On various hydroids on the Eddystone and Rame-Eddystone Gnds. (M.B.A.); in 30 fm. off Polperro! once in trawl refuse Mevagissey! Gorran Haven (Peach); in trawl refuse from Falmouth B. and at l. s. t. St. Michael's M.! Hincks suggests that *Campanularia intertexta*, Couch, may be this species
27. *Halecium beani*, Johnst. On stones, shells, and hydroids from l. s. t. to 60 fm.; n. unc. in Plymouth S. and on the Eddystone Gnds. (M.B.A.); Looe and Polperro! Mevagissey! in trawl refuse from Falmouth B. (Miss Vigurs); on worm-tubes at Helford!
28. *H. halecinum*, Linn. On stones, shells, esp. *Pinna*, and *Chaetopterus* tubes, shallow water to 60 fm.; n. unc. Plymouth S., and on Eddystone, Rame-Eddystone and Looe-Eddystone Gnds. (M.B.A.); off Polperro, Mevagissey! the Dodman, Gorran Haven! and Falmouth in trawl refuse and dredgings; Padstow B. and Scilly!
29. *H. muricatum*, E. and S. Mevagissey r. (J.C.); and in trawl refuse, Falmouth B. r. (Cocks)
30. *H. labrosum*, Alder. Eddystone Gnds. (M.B.A.); on fisherman's lines off the Dodman (Marryat)
31. *H. tenellum*, Hincks. In 18 fm. off Plymouth (M.B.A.)
32. *Haloikema lankesteri*, G. C. Bourne. Duke Rk. and Jennycliff B., Plymouth (M.B.A.); Fowey (Martynt)
33. *Ophiodes mirabilis*, Hincks. On laminarian roots, Padstow B.!
34. *Sertularella gayi*, Lamouroux. Plymouth S.; on fine sand grounds about the Eddystone; dredged also on Rame-Eddystone and Looe-Eddystone Gnds. (M.B.A.); off Polperro and in trawl refuse Mevagissey! on *Gorgonia* 60 fm. off the Dodman (Hincks), and from fisherman's lines, Gorran Haven (Peach)

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35. *Sertularella polyzonias*, Linn. C. along S. coast and at Scilly from l. s. t. to 60 fm. on stones, shells, seaweeds and corallines
36. *S. rugosa*, Linn. On the roots of *Laminaria*, on *Fucus serratus*, sponges, *Flustra foliacea* and various hydroids, l. w. to 30 fm.; Lantivet B. (R.Q.C.) in trawl refuse, Mevagissey! locally c. Falmouth B.!
37. *S. tenella*, Alder. On fisherman's lines off the Dodman, r. (Peach)
38. *S. fusiformis*, Hincks. In crevices in rock pools near l. w.-m., Gyllyngvase, Falmouth!
39. *Diphasia rosacea*, Linn. On shells, stones, wooden piles, hydroids, crustacea, &c. from between t.-m. to 60 fm.; Plymouth S. and occ. on Eddystone Gnds. (M.B.A.); Polperro r. on *Pinna* off the Dodman and at Gorran (Peach); local in Falmouth B. off Cadgwith (Rowe) and in Mount's B.!
40. *D. attenuata*, Hincks. On the fine sand of the outer trawling grounds, Plymouth (M.B.A.); Gorran Haven (Peach)
41. *D. pinaster*, E. and S. C. in trawl refuse, Plymouth (M. B. A.), and occ. Mevagissey and Falmouth
42. *D. tamarisca*, Linn. Eddystone Gnds. (M.B.A.); on *Pinna* in deep water off Mevagissey (R.Q.C.); occ. in trawl refuse, Falmouth
43. *D. pinnata*, Pallas. Five m. S. of the Eddystone (M.B.A.); c. a few miles W. and NW. of the Eddystone (R. Q. C.); Polperro in 40 fm., 10 or 12 m. from the shore (Laughrin); in trawl refuse n. unc. Falmouth; the Lizard (Pallas); Mount's B.!
44. *Sertularia pumila*, Linn. C. between t.-m. all round coast and at Scilly on rocks and seaweeds, esp. on *F. serratus*
45. *S. gracilis*, Hassall. Off the Dodman r. (Peach)
46. *S. operculata*, Linn. On the stems of large *fuci* and of *Laminaria*; abund. Eddystone rock, 1898; c. and in places abund. along S. coast and at Scilly; locally c. on N. at l. t. and in shallow water. In 1899 a clump twenty-five in. in circumference was picked up on the shore at Mevagissey!
47. *S. filicula*, E. and S. On *fuci* from Talland B. (Couch) on *Fucus serratus* at l. s. t. Gyllyngvase (Cocks); has not been found since
48. *S. abietina*, Linn. C. in trawl refuse and in deep water dredgings along S. coast and at Scilly on stones and shells; finest specs. on *Pinna* valves from 60 fm. off the Dodman; on *Pecten opercularis* at Widemouth B., Bude after a storm!
49. *S. argentea*, E. and S. F. c. in trawl refuse and dredgings along S. coast from shallow to deep water on stones and shells, esp. *Pecten*; St. Ives (R.Q.C.), Padstow! and in deep water off Tresco, Scilly (R.Q.C.). In 1905 remarkably abund. at Mevagissey!
50. *S. cupressina*, Linn. Occ. and in places n. unc. in deep water along S. coast and at Scilly; Queen's Gnd., c. in trawl refuse from the Eddystone (M.B.A.); Porthloe! Falmouth, Helford, and St. Ives; Tresco, Scilly (R.Q.C.)
51. *Hydrallmania falcata*, Linn. C. in deep water along S. coast and occ. cast up on N. attached to shells and stones; Tresco, Scilly
52. *Thuiaria thuja*, Linn. From deep water, Polperro (R.Q.C.); in trawl refuse St. Ives and Portreath (Cocks); fragments on Porthcressa B. St. Mary's Scilly (R.Q.C.)
53. *T. articulata*, Pallas. On stones, shells, crustacea, &c., from deep water down to 50 fm. (R.Q.C.); occ. in trawl refuse along S. coast and at St. Ives
54. *Antennularia antennina*, Linn. On shells, esp. *Pinna* and oyster, on stones and often among gravel and muddy sand from shallow water to 30 fm.; c. gen. in trawl refuse along S. coast; St. Ives; St. Mary's, Scilly (R.Q.C.)
55. *A. ramosa*, Lamouroux. With *A. antennina*, but not so plentiful except in the neighbourhood of Mevagissey, where in 1904 and 1905 it was v. abund.!
56. *Aglaophenia helleri*, Marktanner-Turneretscher. Eddystone rock (M.B.A.)
57. *A. pluma*, Linn. On the fronds of *Halidrys siliquosa* and once on *Fucus serratus*; abund. along S. coast as far as Coverack; Scilly (Hincks)
58. *A. tubulifera*, Hincks. N. unc. Eddystone and Rame-Eddystone Gnds. (M.B.A.); on the legs of *Hyas coarctatus* off the Dodman (Peach); on *Gorgia* from deep water (Hincks)
59. *A. myriophyllum*, Linn. F. c. on fine sand and sandy gravel Eddystone and Rame-Eddystone Gnds. (M.B.A.); on the back of the spider crab and on a slab of limestone, Gorran (Peach); from about 50 fm. off the Dodman on a shell fragment with *Rhopalomenia aglaopheniae* twined round its base! on the back of the Corwich crab in trawl refuse, Falmouth (Cocks)
60. *A. pennatula*, E. and S. On *Pinna* from deep water off the Dodman (R.Q.C.); several times on the Corwich crab and the stems of *Laminaria digitata*; a magnificent mass from Gorran Haven (Peach); on *Pecten maximus*, trawl refuse, Falmouth (Cocks)
61. *Plumularia pinnata*, Linn. On shells, stones, wooden piles, sunken timber, worm-tubes, hydroid crustacea, etc., from between t.-m. down to 40 fm.; Plymouth, Rame-Eddystone and Eddystone Gnds. (M.B.A.), and W. to Gorran Haven; unc. in trawl refuse at Falmouth
62. *P. setacea*, Ellis. On sea-weed, rock, stones, sunken timber, worm-tubes, hydroids from between t.-m. to 30 fm.; c. but irregularly dist. Plymouth to Helford; St. Michael's Mt. l. s. t. Hincks' branched var. was originally described by Peach from Cornish specs. and is v. c. around Plymouth, gen. on *Halichondria panicea* (M.B.A.)
63. *P. catharina*, Johnst. On corallines, worm-tubes, shells, esp. *Pinna*, and occ. on tests of *Ascidia* from shallow water down to 60 fm.; c. Eddystone and Rame-Eddystone Gnds. (M.B.A.), and local as far as Helford; a fragment off St. Martin's, Scilly (R.Q.C.)

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64. *Plumularia echinulata*, Lmk. Plymouth S. (M.B.A.); Fowey Harb. r. (Peach); on *Zostera* Falmouth, and St. Ives (Cocks); local in Falmouth B.!
65. *P. similis*, Hincks. C. under the Hoe and on the Devonshire side of Plymouth S. (M.B.A.), occ. off Polperro! among *Laminaria* from Mount's B. (Baily)
66. *P. obliqua*, Saunders. Found by R. Q. Couch off the Cornish coast (Hincks)

(Medusa Stage)

1. *Clytia johnstoni*, Alder. Medusae taken by Browne at Scilly in April-May, 1903, just as they were liberated from the hydroid; adult form, probably *Phialidium temporarium*
2. *Agastria mira*, Hartlaub. A single spec. Plymouth S., August, 1897
3. *Obelia lucifera*, Forbes. V. c. Plymouth, June, 1892; most abund. leptomedusan in the Sound and outside, September, 1897; one at Falmouth, 25 March, a few 13 April, 19 July, and many in August, 1897 (V.); Falmouth most seasons; a few adults at Scilly July, 1899
4. *O. nigra*, Browne. V. abund. Plymouth district, April and May, 1898, and June, 1899; a few adults found by Browne at Scilly in July, 1899
5. *Tiaropsis multicirrata*, Sars. Plymouth, April, 1895; certain protected places in Falmouth Harb. almost solid with these medusae from 20 May to 30 June, 1897 (V.)
6. *Euchilota pilosella*, Forbes. C. every summer at Plymouth; Falmouth Harb. (Cocks); two small specs. Scilly, July, 1899, and either very early or intermediate stages found there early in May, 1903 (Browne)
7. *Laodice calcarata*, Ag. C. Scilly July, 1899, a very early stage, with four tentacles, taken at Scilly, 9 May, 1903; an intermediate stage taken 12 May (Browne).
8. *Phialidium buskianum*, Gosse. Plymouth district, Sept. 1893, Sept. 1895, and Sept. 1897, once in June, 1898; c. Scilly, July, 1899; in May, 1903, only early and immature stages at Scilly (Browne)
9. *P. cymbaloideum*, van Ben. Never v. abund., a few specs. gen. about Plymouth—Sept. 1893, Sept. 1897, April-May, 1898, June-July, 1899
10. *P. temporarium*, E. T. Browne. Nearly always present in the Plymouth and Falmouth waters from spring to autumn, but not found by Browne at Scilly either in July, 1899, or in April-May, 1903
11. *Eutima insignis*, Kieferstein. Taken on at least five occ. in the Plymouth district, but gen. as single specs.
12. *Saphenia mirabilis*, Wright. Plentiful near the Eddystone, July, 1891; occ. in Plymouth district since, but either singly or in very small numbers; taken occ. by Vallentin about Falmouth in June and July; three specs. with well-developed gonads taken at Scilly by Browne, July, 1899
13. *Octorchis gegenbauri*, Haeckel. One spec. in Plymouth district Sept. 1895; four in July, and one in August, 1899

14. *Irene pellucida*, Will. Plymouth rr.; once at Falmouth

TRACHYMEDUSAE

1. *Liriantha appendiculata*, E. Forbes. V. abund. Plymouth district Sept.-Oct. 1893, rr. since
2. *Solmaris coronanthe*, Haeckel. Plymouth, Sept. 1895; spec. of *Solmaris* from Falmouth, but too small for identification (V.)

SIPHONOPHORA

1. *Muggiaea atlantica*, J. T. Cunningham. Gen. found in considerable quantity along S. coast and at Scilly, Aug. and Sept.; occ. at other times
2. *Cupulita sarsi*, Haeckel. Single spec. Plymouth, March, 1902; many detached swimming bells and a few fragments at Scilly, April-May, 1903 (Browne)

STAUROMEDUSAE

1. *Lucernaria campanulata*, Lamouroux. Single specs. Cawsand B. and Whitsand B., E.
2. *Halichystus auricula*, Fab. Occ. on *Zostera* Cawsand B. (M.B.A.); rock-pools Mevagissey and Falmouth B.! f. c. on *Zostera* at Helford in 1902!
3. *Depastrum cyathiforme*, Sars. Drake's Is., Mt. Edgumbe, Rame Hd. (M.B.A.); Mevagissey B.! Gyllyngvase!

DISCOMEDUSAE

1. *Chrysaora isosceles*, L. Occ. during summer months about Plymouth; Falmouth B., scarce
2. *Cyanea capillata*, L. Plymouth; Mevagissey! occ. Falmouth B. and Harb.
3. *C. lamarcki*, Peron and Lesueur. Sparingly every summer at Plymouth; Polperro! Falmouth B.!
4. *Aurelia aurita*, Lamarck. In some years v. abund. in Plymouth district, and occ. as far as Saltash; often plentiful at Fowey and in Falmouth Harb.; taken at times at Malpas; Helford; in 1896 and 1897 almost completely absent from the whole Falmouth dist. (V.); *ephyrae* often taken in enormous quantities in March
5. *Rhizostoma octopus*, L. Occ. Plymouth; Falmouth B.

ALCYONARIA

1. *Sarcodictyon catenata*, Forbes. Red form often abund. in Plymouth dist. on old shells and gen. v.c. on clean shell ground, Eddystone and Rame-Eddystone Gnds. (M.B.A.); Polperro, Mevagissey, Falmouth B. from l. s. t. to 30 fm. r.
2. *Alcyonium digitatum*, L. Large colonies abund. in deep water, Eddystone Gnds. (M.B.A.) off the Dodman and in Falmouth B.; in places n. unc. l. s. t. downwards
3. *A. glomeratum*, Hassall. In trawl refuse Mevagissey, Porthloe! Falmouth B. r.; Mount's B. (Baily)
4. *A. palmatum*, Pallas. Mount's B. (Baily)
5. *Eunicella cavolini*, G. v. Koch. N. unc. on rocky ground, Plymouth district; Queen's Gnd. Rame-Eddystone Gnds. (M.B.A.); c. locally about Polperro! beyond Helford!
6. *Virgularia mirabilis*, Müll. Single spec. Eddystone; once 6 m. WSW. of Penlee Pt. (M.B.A.)

A HISTORY OF CORNWALL

ZOANTHARIA

The Zoantharia, which include the sea anemones and corals, were made a subject of special study by Dr. Cocks at Falmouth, who not only gave a list of local species in his 'Fauna of Falmouth' in 1849, but published a descriptive account of all the county species he had examined, with plates, in the *Ann. Rep. Roy. Cornw. Polyt. Soc.* (1852). Mrs. Gough, of Penzance, devoted a considerable amount of attention to the sea anemones of Mount's Bay, and embodied her observations in a paper in the *Trans. Penz. Nat. Hist. and Antiq. Soc.* (new ser.), ii. (1885-8).

1. *Actinoloba dianthus*, Ellis (*Metridium senilis*, L.). F. c. along S. coast from Whitsand B. to Sennen within l.w.-m. on sheltered shelving rocks, in tidal caves, and occ. to 25 fm.; St. Ives, Newquay, Boscastle, rock-pools of Annett, and from 40 fm. off Menavawr, Scilly!
2. *Sagartia bellis*, E. & S. (*Cereus pedunculatus*, Pennant). Locally c. all round the coast and at Scilly on indented and fissured rocks, in rock-pools and in crevices in muddy nooks. Of Gosse's vars., *tyriensis*, *versicolor*, *modesta* and *sordida* all occur about Mount's B. Cocks's *S. Johnstoni* from Gyllyngvase is probably a variety of this species
3. *S. miniata*, Gosse. Plymouth district (M.B.A.) Gorran! Coverack! Mount's B. (Mrs. Gough), Scilly and Boscastle!
4. *S. rosea*, Gosse. Recorded so far only from the Manacles and from Scilly (Alford)
5. *S. ornata*, Holdsworth. Single specs. from Mount's B. (Tregelles), Padstow on the roots of *Laminaria digitata*!
6. *S. venusta*, Gosse. St. Michael's Mt. (Marquand), Annett, Scilly and near Newquay on washed-up *Laminaria*!
7. *S. nivea*, Gosse. Once at Plymouth (M.B.A.); also on a *Pinna* valve in trawl refuse, Mevagissey! and at Scilly (Alford)
8. *S. (Thoe) sphyrodeta*, Gosse. Plymouth S. (M.B.A.); Scilly (Alford)
9. *S. pallida*, Holdsworth. Found by Tregelles in trawl refuse from Mount's B.
10. *S. coccinea*, Müller. Found on the S. coast by Peach
11. *S. troglodytes*, Gosse (*Cylista undata*, Müller). Gen. dist. along S. coast, in rock crevices between t.-m. just beyond l.w.-m. and in deepish water; c. Plymouth (M.B.A.); Whitsand B. (Couch), Polperro, Fowey, Gorran Haven, Falmouth, Coverack, Sennen, near Newquay, at Boscastle; Tresco, Annett and St. Martin's, Scilly!
12. *S. (Cylista) viduata*, Müll. C. Plymouth (M.B.A.); Falmouth, and f.c. between t.-m. at Helford; Annett, Scilly! on 13 March, 1904, was abund. at Padstow after a violent gale!
13. *S. parasitica*, Couch (*Adamsia polypus*, Forskal). Apparently n. unc. at 5 to 30 fm. gen. associated with *Eupagurus bernhardus*, but occ. found on *Pinna ingens*, *Cyprina islandica*, and on the claw of the Corwich crab, *Maia squinado* (Couch); c. Plymouth, Fowey, Mevagissey, Gorran Haven, Falmouth, Helford, Penzance, St. Ives, Newquay, and at Scilly!
14. *S. chrysosplenium*, Cocks. Scarce but occ. found under surfaces of stones at extreme l.w. and in rock-pools at Gyllyngvase, Pennance, Helford and St. Ives (Cocks); Laregan Rocks, Mount's B. (Mrs. Gough)
- S. Alderi*, Cocks. } Described by W. P. Cocks
S. pellucida, Cocks. } from specs. from Falmouth,
S. Yarrelli, Cocks. } but not satisfactorily identified by any subsequent
S. bellii, Cocks. } naturalist
15. *Adamsia palliata*, Bohadsch. Gen. dist. and c. on S. coast, 15 to 30 fm., with *Eupagurus prideaux*; St. Ives, Newquay, Padstow and Scilly!
16. *Aiptasia Couchii*, Cocks. Plymouth district not infrequently (M.B.A.); Falmouth, Mawnan Beach and Helford river (Cocks)
17. *Anthea cereus*, E. & S. (*Anemonia sulcata*, Pennant). Abund. in bright shallow pools between t.-m. all along the S. and locally on the N. coast; Annett, Tresco, and St. Mary's, Scilly, c.! vars. *smaragdina*, *rustica*, *sulphurea*, and *alabastrina* occur in Mount's B. (Mrs. Gough)
18. *Actinia mesembryanthemum*, E. & S. (*Actinia Eques*, Linn.). Most abund. along S. and locally on N. coast, and at Scilly on rocks and stones between t.-m. The eleven vars. described by Gosse occur in Mount's B. (Mrs. Gough)
19. *Bolocera tuediae*, Johnst. Occ. among trawl refuse at Falmouth (Cocks), and once at Gorran Haven!
20. *Bunodes gemmacea*, E. & S. Gen. dist. and often c. on exposed rocks and shallow pools between t.-m.; Annett abund. and f. c. in other parts of Scilly!
21. *B. Ballii*, Cocks. Plymouth (M.B.A.); the type occurs sparingly about Falmouth and in Mount's B. from tidal ground to deep water. Var. *dealbata* at Fowey and Gorran Haven and *funesta* at Scilly (Alford)
22. *B. (Chitonactis) coronata*, Gosse. A single spec. on the Rame-Eddystone Gnds. (M.B.A.), and one off the Dodman!
- [*Egeon Alfordi*, Gosse. Discovered by the Rev. D. P. Alford at Scilly, but apparently not referred to by subsequent writers]
23. *Paraphellia expansa*, Haddon. A few specs. on the Eddystone Gnds. apparently buried in the sand; Rame-Eddystone Gnds. (M.B.A.)
24. *Tealia (Chondractinia) digitata*, Müll. A few about the Eddystone (M.B.A.) and about Falmouth (Cocks); one from Mount's B. (Dunn)

MARINE ZOOLOGY

25. *Tealia crassicornis*, Müller (*Urticina felina*, Linn). Gen. dist. and locally abund. along the entire coast and at Scilly, littoral to 20-30 fm. Gosse's five vars. recorded from Mount's B. (Mrs. Gough)
26. *T. tuberculata*, Cocks (?). C. on shelly ground off the Dodman, most frequently on valves of *Cyprina islandica* and *Pinna*, also in 30 fm. of water W. of the Eddystone (Cunningham); Cocks found it on *Pecten maximus* 13 m. SW. of Falmouth
27. *Ilyanthus Mitchellii*, Gosse. A dead spec. obtained by Tregelles from trawl refuse, Penzance
28. *Peachia bastata*, Gosse. A single living spec. Helford, 25 Oct. 1905!
29. *Halcampa chrysanthellum*, Peach. Discovered by Peach under stones in muddy sand near l.w. Fowey; found by Cocks and by Vallentin at Falmouth; N. of Tresco, 1903!
30. *Gonactinia prolifera*, Sars. Dredged for the first time off the coast of Great Britain by Vallentin on old oyster shells near the Vilt Buoy, Falmouth, on 5 June, 1893; found again by the same naturalist on some clean dead oyster valves from the main channel of Falmouth Harb. early in July, 1897
31. *Edwardsia callimorpha*, Gosse. Several dead and one living spec. in trawl refuse at Falmouth, 1899!
32. *E. carnea*, Gosse. Two specs. Mevagissey, 1897
33. *Cerianthus Lloydii*, Gosse. Once, Drakes Is.; single adult spec. taken in muddy sand off Fowey, 1901! the free-swimming larvae *Arachnactis albida* often abund. in tow-net gatherings at Falmouth
34. *Zoanthus (Epizoanthus) Couchii*, Johnst. F. c. in deep water off the south coast; St. Ives, Newquay, and off N. of Tresco, Scilly!
35. *Z. incrustatus*, Düben and Koren. A characteristic species of, and confined to, the 'Outer' trawling gnds. at the Eddystone (M.B.A.); in trawl refuse, Penzance, 1903!
36. *Capnea sanguinea*, Forbes. Obtained by Cocks on a valve of *Pecten maximus* dredged 4 leagues W. of Falmouth; from about 40 fm. to W. of Menavawr, Scilly!
37. *Aureliania augusta*, Gosse. One spec. found by Tregelles among trawl refuse from Mount's B.; one at Boscastle that lived in captivity for several weeks!
38. *A. heterocera*, Thompson. One spec. found by Tregelles on trawl refuse, Mount's B.
39. *Corynactis viridis*, Allman. F. gen. in dist. and not r. on rocky ground on S. coast between t-m. to 20 or 30 fm.; St. Ives, Newquay, and Boscastle, and frequently at Scilly!
40. *Caryophyllia Smithii*, Stoker. Gen. abund. on stones and shells and in crevices in rocky stations on S. coast at 20 fm. or more; Newquay, Cowrie Haven near Bude and at Scilly!
41. *Sphenotrochus Wrightii*, Gosse. Obtained by Peach in Lantivet B.
42. *S. Macandrewanus*, Thompson. Dredged off Scilly by MacAndrew and obtained by Peach off the Dodman.
43. *Balanophyllia regia*, Gosse. N. unc. on W. coast at extreme l. w.; Mousehole and St. Michael's Mt. (Marquand), Sennen B.! between Zennor and St. Ives (J.C.), E. of Godrevy (Dr. Montgomery)

CTENOPHORA

These have received little attention, and there are certainly more species in the county waters than the four given below:—

1. *Bolina infundibulum*, Fab. Abund. some years about Plymouth, May; also recorded in Sept.
2. *Beroe cucumis*, Fab. A few small specs. at Plymouth; Scilly! Specs. of *Beroe* occ. Falmouth, but not identified
3. *B. ovata*, Eschscholtz. A very early stage, Scilly, May, 1903 (Browne).
4. *Pleurobranchia pileus*, Fab. Abund. about Plymouth towards end of May, and in some years c. Mevagissey and Falmouth, B.

ECHINODERMA

The literature on Cornish Echinoderms consists chiefly of a very full list of the species from Falmouth Harbour and Bay by Dr. Cocks in the *Trans. Penz. Nat. Hist. and Ant. Soc.* (old ser.), i, and in his 'Fauna of Falmouth' (*Ann. Rep. Roy. Cornw. Polyt. Soc.* 1849), of a paper on the 'Echinodermata of Mount's Bay,' by Mr. G. F. Tregelles (*Penz. Trans.* new. ser. i), and of the section on Echinodermata in the *Journ. Marine Biol. Assoc.* vol. vii, pt. 2. In the *Catalogue of British Echinoderms* by Professor F. Jeffrey Bell, many Cornish specimens are referred to. Records from this *British Museum Catalogue* are marked (B.M.) in the following list. In North's *Week at the Isles of Scilly* a brief list of species is given from the western archipelago:—

1. *Synapta digitata*, Montagu. Occ. specs. Rame-Eddystone Gnds. (M.B.A.); Polperro (B.M.); Falmouth (Cocks), Helford river!
2. *S. inbaerens*, O. F. Müll. On gravelly bottom, Polperro (B.M.); Helford river! Scilly!
3. *Cucumaria brunnea*, Thompson. C. on hydroids, algae, etc., from rocky ground and from trawling gnds. around Plymouth (M.B.A.); off the Dodman! Falmouth B.!

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4. *Cucumaria hyndmanni*, Thompson. Occ. specs. Rame-Eddystone and Looe-Eddystone Gnds. (M.B.A.), off the Dodman; one spec. off Helford river!
 5. *C. normani*, S. Pace. N. unc. in crevices and under stones on rocky ground about Plymouth l. w. to 10 fm. (M.B.A.); Polperro, and locally in Falmouth B. down to 25 fm.!
 6. *C. saxicola*, Brady & Robertson (*C. pentactes*, Müll.). F. c. along S. coast under stones between t-m., in crevices of rock at l. w. and in trawl refuse; occ. Scilly!
 7. *C. lactea*, Forbes & Goodsir. Occ. Falmouth B. and Mount's B.
 8. *C. frondosa*, Gunner. One spec. off the Dodman (Dunn); one from Plymouth (B.M.).
 9. *Thyone fusus*, O. F. Müll. Occ. specs. Cawsand B. and in 15 to 35 fm. on gnds. outside Plymouth S. (M.B.A.); at times in Falmouth B. chiefly after storms, and twice, l. s. t. Scilly
 10. *Psolus phantopus*, Linn. N. unc. in trawl refuse at Falmouth (Cocks)
 11. *Phyllophorus drummondi*, Thompson. Occ. Falmouth
 12. *Holothuria nigra*, Gray. Occ. specs. Queen's Gnd. Plymouth, off Penlee, on clean shell gravel, Eddystone Gnds., Whitsand B. (M.B.A.); in 20 fm. off Polperro (B.M.); off Gyllyngvase, Falmouth; f.c. Mount's B. 5 to 20 fm.; n. unc. Scilly! near Newquay!
 13. *Antedon bifida*, Pennant. Known in Cornwall 200 years ago, as Llwyd sent specs. from Penzance to Link of Leipzig when the latter was engaged on his magnificent folio; Plymouth district, v. abund. in certain small areas, but practically limited to these (M.B.A.); locally abund. Porthscatho 15 to 20 fm. in great var. of colour! n. unc. Falmouth, deep water and extreme l.w-m. (Cocks); c. locally Mount's B.; at Scilly frequent between t-m. in 1903 and infested with *Myxostoma*!
- [*Pontaster tenuispinis*, Düb. & Kor. Obtained by the Porcupine SW. of Scilly in 305 fm. (B.M.)]
14. *Astropecten irregularis*, Pennant. C. along the S. coast in 10 to 35 fm. on fine clean sand; St. Ives B., Newquay, Padstow and occ. at Scilly!
 15. *Luidia ciliaris*, Philippi. F. c. between t-m. to deep water, Polperro to Mount's B.
 16. *L. sarsii*, Düb. & Koren. Eddystone Gnds. (M.B.A.); off Gorran Haven! one spec. Helford river!
 17. *Hippasterias phrygiana*, Parelius. N. unc. in trawl refuse at Falmouth (Cocks)
 18. *Porania pulvillus*, O. F. Müll. Occ. at about 3 m. S. of Plymouth Breakwater, and on Eddystone Gnds. (M.B.A.); r. in trawl refuse at Falmouth (Cocks); n. unc. deep water Mount's B. (Tregelles)
 19. *Asterina gibbosa*, Pennant. C. rock-pools along S. coast; Scilly, on Annett, St. Martin's and Porth Cressa B., St. Mary's! near Newquay!
 20. *Palmipes placenta*, Pennant. F. c. in places along S. coast in 15 to 30 fm.; Eddystone and Rame-Eddystone Gnds., f. c. about 3 m. S. of the breakwater (M.B.A.); Gorran Haven, Falmouth B. and Mount's B.
 21. *Stichaster roseus*, Müll. In deep water off the Dodman! n. unc. in trawl refuse, Falmouth (Cocks)
 22. *Solaster papposus*, Fab. F. c. 10 fm. downwards along S. coast; occ. l. s. t.; Scilly
 23. *S. endeca*, Linn. Occ. deep water; off the Dodman! Falmouth B. (Cocks)
 24. *Henricia sanguinolenta*, O. F. Müll. N. unc. locally, l. s. t. downwards; Eddystone Gnds. (M.B.A.); off the Dodman! Falmouth B.; Mount's B.; W. of Menavawr, Scilly!
 25. *Asterias glacialis*, Linn. C. along S. coast and locally at Scilly, l.w-m. to 40 fm. or more; Perranporth, Newquay, Padstow!
 26. *A. rubens*, Linn. Occ. in pools between t-m. and gen. c. in deep water round coast and at Scilly
 27. *A. hispida*, Pennant. Two specs. in trawl refuse at Falmouth (Cocks), and one at Mevagissey (Mathias Dunn)
 28. *Ophiura ciliaris*, Linn. C. in deep water along S. coast, Plymouth to Mount's B.
 29. *O. albida*, Forbes. Gen. along S., often found with *O. ciliaris* in 5 to 20 fm.
 30. *Ophiocnida brachiata*, Mont. C. on a *Zostera* bed in Plymouth S. (M.B.A.); Falmouth; Helford!
 31. *Amphiura chiajii*, Forbes. Two specs. from Plymouth district (M.B.A.); very local Falmouth B.! 'When dredging off Penlee Pt., Penzance, a mass of writhing miniature snakes came up, completely entangled and as big as two fists. These were detached arms of *A. chiajii* with not a single disc among them... Though the fine sand betwixt St. Michael's Mount and Mousehole Island teems with unattached arms, whole specimens are very rare.' (Tregelles)
 32. *A. filiformis*, Müll. One spec. 2 m. WSW. of Eddystone (M.B.A.); v. scarce Falmouth Harb. and B.; a single arm Mount's B. (Tregelles)
 33. *A. elegans*, Leach. C. and in places abund. under stones, in rock-pools, and among coral-lines from Plymouth to Mount's B.
 34. *Ophiactis balli*, Thompson. C. but local along the S. coast and at Scilly in rock crevices, under stones, on roots of algae, shells, *Flustra*, tubes of *Chaetopterus* and egg cases of *Fusus* and *Buccinum*; occ. in rock-pools but gen. l. s. t. to 40 fm.; Newquay!
 35. *Opheopholis aculeata*, L. Recorded by Cocks as n. unc. in trawl refuse, Falmouth
 36. *Ophiocoma nigra*, Müll. Gen. dist. in Plymouth district where its numbers vary greatly according to locality (M.B.A.); Polperro! Mevagissey in trawl refuse! very irregularly dist. but not unc. in Falmouth B.! one small spec. Mount's B. (Tregelles)

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37. *Ophiopsila aranea*, Forbes. N. unc. Mewstone Ledge and Stoke Pt. Gnds., Plymouth (M.B.A.); one spec. Polperro (Robinson); two in trawl refuse, Mevagissey!
38. *Ophiobrix fragilis*, Müll. Occurs along the S. coast and locally on the N.; often plentiful and at times abund. under big stones, in crab pots and irregularly from all depths to 40 fm.; Scilly!
39. *Echinus acutus*, Lamk. Gen. dist. Plymouth Gnds. 15 to 35 fm., commoner in deeper water where it replaces *E. esculentus* (M.B.A.); Polperro, trawl refuse Mevagissey! locally Falmouth B.; one spec. Mount's B. (Tregelles); one adult and one young spec. from 30 fm. off Menewethan, Scilly (Carus)
40. *E. miliaris*, Leske. C. along S. coast in rock crevices between t-m. to 35 fm.; Scilly
41. *E. esculentus*, L. Occ. Queen's Gnd., c. outside Plymouth breakwater in 15 to 35 fm. (M.B.A.); c. Polperro and in trawl refuse, Mevagissey and Falmouth; abund. Penzance at all depths, weed gatherers often collecting numbers in from 1 to 2 fm. (Tregelles); c. at Scilly, where in April, 1904, spines in remarkable abund. were found in the sand in depressions among the lower rocks on Outer Innisvoul!
- [*E. melo*, Lamk. Forbes (Rep. Brit. Assoc. 1855, p. 153) speaks of an *Echinus* found by Peach on the Cornish coast as 'apparently identical with *E. melo* of the Mediterranean,' but doubt has been expressed as to the occurrence of this species in the British Isles.]
42. *Strongylocentrotus droebachiensis*, Müll. R. in trawl refuse at Falmouth (Cocks)
43. *S. lividus*, Lamk. N. c. in trawl refuse Falmouth Harb. (Cocks)
44. *Echinocyamus pusillus*, Müll. N. unc. on gravel bottom in 10 to 35 fm. Plymouth district (M.B.A.); Polperro; Falmouth; f. c. Mount's B. and at Scilly; the white shells denuded of spines at Porthcurnow and elsewhere!
45. *Spatangus purpureus*, Müll. F. c. in coarse sand and gravel on most of the 'grounds' in Plymouth district (M.B.A.); Polperro, Mevagissey and Falmouth in trawl refuse; Helford; at Penzance brought in by the trawlers from deep water (Tregelles); n. unc. locally, Scilly; Perranporth!
46. *Echinocardium cordatum*, Pennant. Occ. Cawsand B. and outside the Plymouth Breakwater in 15 to 35 fm. on fine sand (M.B.A.); Mevagissey! local in Falmouth B.! v. c. in *Ampbiura chiajii* sand, Mount's B.; F. W. Millett described them on one occ. as ankle-deep between Marazion and Penzance (Tregelles)
47. *E. pennatifidum*, Pennant. N. unc. Rame-Eddystone and Looe-Eddystone Gnds., Plymouth (M.B.A.)
48. *E. flavescens*, Müll. R. Looe-Eddystone Gnds. with *E. pennatifidum* (M.B.A.)

TURBELLARIA

The Turbellaria or flat-worms of Cornwall have up to the present received very little attention. Dr. Cocks recorded a few from Falmouth, but the only publication of importance on the subject is 'The Turbellaria of Plymouth Sound,' by Dr. F. W. Gamble (*Journ. Marine Biol. Assoc.* iii). The following is a list of the species recorded by Dr. Gamble, all of which were obtained in the Plymouth district. A few additional localities have been added where there was no doubt about the identification:—

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| <i>Proporus venenosus</i> , O. Schmidt | <i>Provortex balticus</i> , Schultze | <i>Monotus lineatus</i> , O. F. Müller |
| <i>Monoporus rubropunctatus</i> , O. Schmidt | — <i>affinis</i> , Jensen | — <i>fuscus</i> , Oersted |
| <i>Aphanostoma diversicolor</i> , Oersted | — <i>rubrobacillus</i> , Gamble. Encysted stage c. Pentuan, Falmouth | — <i>albus</i> , Levinsen |
| — <i>elegans</i> , Jensen | <i>Fecampia erythrocephala</i> , A. Giard | <i>Automolus unipunctatus</i> , Oersted |
| <i>Convoluta saliens</i> , v. Graff | <i>Plagiostoma dioicum</i> , Metschnikoff | — <i>horridus</i> , Gamble |
| — <i>paradoxa</i> , Oersted, Falmouth | — <i>elongatum</i> , Gamble | — <i>ophiocephalus</i> , Schmidt |
| — <i>flavibacillum</i> , Jensen | — <i>pseudomaculatum</i> , Gamble | <i>Fovia affinis</i> , Stimpson. Whitsand B., E.; Pentuan; Falmouth |
| <i>Microstoma groenlandicum</i> , Lev. | — <i>sagitta</i> , Uljanin | <i>Cryptocelis alba</i> , Lang |
| <i>Promesostoma marmoratum</i> , Schulze | — <i>caudatum</i> , Levinsen | <i>Leptoplana tremellaris</i> , O. F. Müller. C. Falmouth, Helford |
| — <i>ovoideum</i> , O. Schmidt | — <i>vittatum</i> , Frey u. Leuckart. Polperro; Falmouth; Helford | — <i>draebachensis</i> , Oersted |
| — <i>solea</i> , O. Schmidt. Falmouth; Helford | — <i>Koreni</i> , Jensen | — <i>fallax</i> , Quatrefages |
| — <i>agile</i> , Levinsen | <i>Plagiostoma siphonophorum</i> , Schmidt | <i>Stylochoplana maculata</i> , Quatrefages |
| <i>Byrsophleps Graffi</i> , Jensen | — <i>girardi</i> , Schmidt | <i>Prostheceraeus vittatus</i> , Mont. Polperro; Gyllyngvase, Falmouth |
| — <i>intermedia</i> , v. Graff | <i>Vorticeros auriculatum</i> , O. F. Müller. Pentuan; Falmouth | <i>Cycloporus papillosus</i> , Lang. On Botryllus, Falmouth and Scilly |
| <i>Proxenetes cochlear</i> , v. Graff | — <i>luteum</i> , v. Graff | <i>Eurylepta cornuta</i> , O. F. Müller. Mevagissey; Falmouth B. |
| — <i>flabellifer</i> , Jensen | <i>Enterostoma austriacum</i> , v. Graff | <i>Oligocladus sanguinolentus</i> , Quatrefages. Falmouth B. |
| <i>Mesostoma neapolitanum</i> , v. Graff | — <i>singallianum</i> , Claparède | <i>Stylostomum variabile</i> , Lang. |
| <i>Pseudorhynchus bifidus</i> , McIntosh | <i>Cylindrostoma quadrioculatum</i> , R. Leuckart | <i>Prosthiostomium siphunculus</i> , Delle Chiaje |
| <i>Acrorhynchus caledonicus</i> , Claparède | — <i>inermis</i> , Hallez | |
| <i>Macrorhynchus naegeli</i> , Kölliker | — <i>elongatum</i> , Levinsen | |
| — <i>croceus</i> , Fab. | <i>Monoophorum striatum</i> , v. Graff | |
| — <i>belgolandicus</i> , Metschnikoff | | |
| <i>Gyrator hermaphroditus</i> , Ehrbg. | | |
| <i>Hyporhynchus armatus</i> , Jensen | | |
| — <i>penicillatus</i> , Schmidt | | |

A HISTORY OF CORNWALL

NEMERTINI

The Nemertean worms have only received intermittent attention at Truro, so that the list gives a very inadequate idea of the distribution of many of the species. A systematic account has been kept of those found during dredging excursions in Falmouth Bay, but from Polperro, Mevagissey and Gorran the records are fragmentary. Littoral species only have been obtained from Mount's Bay, and Scilly is represented by a few specimens picked up casually during the summer of 1903. The list is based on that published for the Plymouth district by Mr. J. H. Riches in the *Journ. Marine Biol. Assoc.* vol. iii, and the nomenclature followed is chiefly that of Bürger in *Nemertinen des Golfes von Neapol*, 1895.

1. *Carinella linearis*, Mont. Two specs. Duke Rk. 1892 (M.B.A.) ; one near Looe (Marryat) occ. found between t-m. and in *Zostera*, as at Fowey, Mount's B. and Tresco Flats, Scilly !
2. *C. polymorpha*, Renier. One spec. half-way between Rame and Eddystone ; one 4 m. W. of the Eddystone (M.B.A.)
3. *C. superba*. Drake's Is., Rame to Eddystone and Eddystone Gnds. (M.B.A.) ; 20 fm. Falmouth B. !
4. *C. annulata*, Mont. Asia shoal and Queen's Gnd., 6 m. SW. of Rame, Eddystone Gnds. (M.B.A.) ; 15 fm. off Polperro ! off Mevagissey ! One small but typical spec. under a stone at l.w-m. Gyllyngvase beach, Falmouth, August, 1905 !
5. *Cephalothrix bioculata*, Oersted. C. between t-m. about Plymouth (M.B.A.) ; Polperro, Mevagissey, and Falmouth in sand and mud ! Marazion and Mousehole !
6. *C. linearis*, Rathke. A few in deepish water outside Plymouth Breakwater, but chiefly between t-m. in Rum B. (M.B.A.) ; 4 from sand between t-m. near Gorran Haven ! several near Swanpool, Falmouth (Thomas) ; 2 from Marazion !
7. *Eunemertes gracilis*, Johnst. About Plymouth Breakwater and Drake's Is. (M.B.A.) ! among roots of *Laminaria*, Mevagissey and Falmouth ! Mount's B. !
8. *Nemertes neesi*, Oersted. Abund. Plymouth Breakwater ; found on the Bridge and Drake's Is. (M.B.A.)
9. *Nemertopsis flavida*, McIntosh. C. in Plymouth S. (M.B.A.) ; occ. found between t-m. at Falmouth, Helford, Mount's B. and Sennen !
10. *Ampiporus pulcher*. Taken once or twice on the Eddystone Gnds. (M.B.A.)
11. *A. lactiflorus*, Johnst. Under stones and sea-weed between t-m. ; c. Drake's Is. and Mt. Edgumbe (M.B.A.) ; Looe (Marryat) ; Mevagissey, Gorran Haven, Falmouth, and Helford ! l. s. t. Marazion ! Sennen Cove
12. *A. dissimulans*, Riches. Abund. Millbay Chan. Once between t-m. Drake's Is. ; dredged Asia shoal (M.B.A.) ; Falmouth Harb. 10 fm. !
13. *Depranophorus spectabilis*, Quatrefages. Queen's Gnd., Cawsand B., Eddystone Gnds. (M.B.A.) ; Falmouth B. in an eroded stone from 25 fm. !
14. *Tetrastemma candidum*, Müll. The type and various forms or species closely allied to it c. in Plymouth S. and Falmouth Harb. and B., and
15. *Tetrastemma cephalophorum*, Bürger. Dredged Queen's Gnd., Drake's Rk. and elsewhere in Plymouth S. (M.B.A.)
16. *Oerstedtia dorsalis*, Zool. Dan. V.c. in dredgings from Cawsand B., Queen's Gnd., Asia shoal, 5 m. S. of Penlee Pt., Eddystone Gnds. (M.B.A.) ; in 30 fm. off Polperro, in 12 fm. off Pennance ! abund. in *Zostera* in spring of 1904 at Falmouth !
17. *O. nigra*, Riches. On *Codium* and other weeds from the laminarian zone in Plymouth S. (M.B.A.) ; on *Codium* between Gyllyngvase and Swanpool, Falmouth ! Scilly !
18. *O. immutabilis*, Riches. Among weeds on the shore and dredged at Duke Rk., Plymouth S. (M.B.A.) ; 2 specs. dredged off Polperro !
19. *Malacobdella grossa*, Müll. A single example occurs in the branchial cavity of almost every spec. of *Cyprina islandica* taken around Plymouth, Polperro, and Falmouth
20. *Eupolia curta*, Hubrecht. Eddystone Gnds. and 2 m. W. of Eddystone ; one small spec. Queen's Gnd. (M.B.A.)
21. *Lineus longissimus*, Gunn. Occ. specs. dredged and found on the shore in all parts of Plymouth S., largest 6 ft., the majority much less ; Eddystone Gnds. (M.B.A.) ; n. unc. along S. coast under stones at l. w. One on Pentewan beach July, 1905, over 20 ft. long and only $\frac{1}{8}$ in. thick ; one at Tresco Scilly among weed on a barge, several specs. St. Mary's !
22. *L. gesserensis*, Müll. Apparently c. under stones between t-m. all along S. coast : v.c. in Falmouth district
23. *L. lacteus*, Grube. Between t-m. on N. of Drake's Is., and occ. in Cawsand B. (M.B.A.)
24. *L. bilineatus*, McIntosh. Dredged on all stony ground in Plymouth S., the Eddystone Gnds., and $1\frac{1}{2}$ m. S.W. of Penlee Pt. (M.B.A.) ; n. unc. near Mevagissey and locally in Falmouth B. !
25. *Micrura fasciolata*, Ehrenberg. Dredged from stony ground in all parts of Plymouth S., on the Rame-Eddystone and Eddystone Gnds. (M.B.A.) ; Gorran Haven, and n. unc. in Falmouth B. and Helford !
26. *M. purpurea*, Dalyell. In dredgings from stony ground Plymouth S. and on the Eddystone Gnds. (M.B.A.) ; Polperro ! Helford in 10 to 15 fm. !

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27. *M. aurantiaca*, Grube. Single specs. Queen's Gnd., Asia shoal, and elsewhere in Plymouth S. (M.B.A.)
28. *Cerebratulus fuscus*, McIntosh. On Queen's Gnd., Drake's Is., Eddystone Gnd., &c. (M.B.A.); Polperro ! and unusually large spec. Falmouth under weed-covered stones at l. s. t. !

CHAETOPODA

Except for a paper entitled 'Horae Zoologicae' by R. Quiller Couch (*Trans. Penz. Nat. Hist. and Antiq. Soc.* old series, i, 1845), and a section in Dr. Cocks's 'Fauna of Falmouth' this important group seems to have been completely neglected by county naturalists. But for the invaluable assistance given by Mr. H. Thomas, who took up the study of Cornish sea-worms with extraordinary enthusiasm the county list would have been somewhat meagre both in species and in details, for the help he gave went far beyond the records to which his name is attached.

ARCHIANNELIDA

1. *Dinophilus taeniatus*, Harmer. More or less abund. in spring on green algae and mud in rock pools round Plymouth (M.B.A.), at Gorran, Falmouth and Helford ! No spec. found about Falmouth in 1904
2. *Polygordius apogon*, McIntosh ? Dredged on the Eddystone Gnds. (M.B.A.)
3. *Protodrilus leuckarti*, Hatschek. Reared at Plymouth from tow-nettings taken in Sept. (M.B.A.)
4. *Histiobdella bomari*, van Beneden. Frequent on the eggs of lobsters taken off Plymouth (M.B.A.)

POLYCHAETA

1. *Typosyllis prolifera*, Krohn. Drake's Is., Queen's Gnd., &c., Plymouth S. (M.B.A.) ; 2 specs. from mud in Falmouth Harb. !
2. *T. alternosetosa*, de St. Joseph. Dredged on the Eddystone Gnds. (M.B.A.)
3. *Syllis cornuta*, Rathke. Dredged on the Eddystone Gnds. (M.B.A.) ; off Polperro (Thomas)
4. *S. Krohnii*, Ehlers. In tubes of sand under stones at l. w. ; occ. colonies at Helford and St. Minver !
5. *S. armillaris*, Müll. Near Maenporth at l. s. t.
6. *S. gracilis*, Grube. In dredgings from Queen's Gnd. (M.B.A.) ; off Polperro (Thomas)
7. *Odontosyllis ctenostoma*, Claparède. From the shore under stones and among weeds, &c. ; Drake's Is., Plymouth S. (M.B.A.) ; near l. w.-m. Gyllyngvase, Falmouth and Helford !
8. *O. fulgurans*, Claparède. In dredgings from Queen's Gnd. Plymouth (M.B.A.)
9. *O. gibba*, Claparède. In dredgings from Queen's Gnd. and Asia shoal (M.B.A.)
10. *Trypanosyllis zebra*, Grube. Frequent in dredgings from Asia shoal and Millbay Chan., Plymouth (M.B.A.) ; in shallow water off Polperro (Thomas) ; 1 spec. in 10 fm. off Helford !
11. *Amblyosyllis spectabilis*, Johnston. Not infrequent from Asia shoal and Queen's Gnd., Plymouth, occ. Eddystone Gnds. (M.B.A.) ; in 30 fm. off Polperro (Thomas) and in 20 fm. Falmouth B. !
12. *Sphaerosyllis ovigera*, Langerhans. One spec. in dredgings from Queen's Gnd. (M.B.A.)
13. *Pionosyllis malmgreni*, McIntosh. Under stones near l. w.-m. near Mevagissey and at Pennance, Falmouth !
14. *Autolytus pictus*, Ehlers. Often c. in Plymouth S. among sponges and *akyonidium* (M.B.A.) ; occ. plentiful at Polperro (Thomas), Pentuan, Gyllyngvase and Helford ! c. Mount's B.
15. *A. prolifer*, Müller. Occ. at l. s. t. Falmouth beaches
16. *A. rubropunctatus*, Grube. Frequent in dredgings from Queen's Gnd. (M.B.A.)
17. *Myrianida pinnigera*, Mont. Frequent in Plymouth S. (M.B.A.) ; on an overgrown timber baulk on the old breakwater at Falmouth Harb.
18. *M. fasciata*, Milne Edwards. The anterior half of an adult spec. in trawl refuse at Mevagissey !
19. *Kefersteinia cirrata*, Keferstein. Under stones at l. w. m. Drake's Is., Mt. Edgcombe, and in dredgings from Asia shoal (M.B.A.)
20. *Castalia punctata*, Müll. C. in dredgings from Asia shoal, and occ. Queen's Gnd. (M.B.A.) ; in 10 fm. Falmouth B. !
21. *Magalia perarmata*, Marion et Bobretzky. N. unc. in dredgings from Asia shoal and Queen's Gnd., Plymouth (M.B.A.) ; off Helford !
22. *Aphrodite aculeata*, Linn. On most fine-sand grounds off Plymouth, between 20 and 30 fm. (M.B.A.) ; between t.-ms. on the S. coast occ. after very stormy weather ; dredged in 30 fm. off Polperro (Robinson), in 40 and taken in 60 fm. off the Dodman and in 25 fm. Falmouth B. ! In March, 1905, several hundreds were thrown up on W. side of Bryher, Scilly, and a number on St. Mary's !
23. *Hermione hystrix*, Savigny. Most frequently on gravel grounds in the neighbourhood of the Eddystone (M.B.A.) ; in 20 fm. off Polperro (Thomas) ; occ. in 10 to 25 fm. Falmouth B. !
24. *Lepidonotus squamatus*, Linn. C. along the S. coast from under stones and sea-weed between t.-m. down to 60 fm. ; sometimes abund. in the laminarian zone ; Porth Cressa B., St. Mary's, Scilly, and on Annett !
25. *L. clava*, Mont. C. under stones and clumps of *fuci*, esp. at s. t. l. w.-m. all along the S. coast

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26. *Gattyana cirrosa*, Pallas. In dredgings near the Eddystone (M.B.A.); off Polperro commensal with *Amphitrite Johnstoni* (Thomas); on St. Martin's bar, Scilly, commensal with *Chaetopterus*!
27. *Lagisca floccosa*, Savigny. C. all along the S. coast from between t-m. down to 40 fm.
28. *L. extenuata*, Grube. N. unc. about Plymouth breakwater; Eddystone Gnds. scarce (M.B.A.); among roots of *Laminaria*, Talland B. (Thomas), Gorran haven, Gyllyngvase! 2 specs. Helford!
29. *L. rarisipina*, Sars. Eddystone Gnds. (M.B.A.)
30. *Harmothoe imbricata*, Linn. About Plymouth Breakwater among laminarian roots and on Eddystone Gds. (M.B.A.); 3 specs. among *fucus* near l. w-m. between Gyllyngvase and Swanpool! under stones at Coverack!
31. *H. spinifera*, Ehlers. C. Plymouth S. on rocks and stones (Hodgson), near Polperro (Thomas); near Mevagissey! near the Manacles!
32. *H. lunulata*, delle Chiaje. Plymouth breakwater and bridge (Hodgson); under stones at l. s. t. near Polperro (Thomas)
33. *H. setosissima*, Sav. Among *Cellaria* and in *Chaetopterus* tubes from the Eddystone Gnds. (M.B.A.); one spec. off the Dodman in 40 fm.!
34. *H. areolata*, Grube. Among Polyzoa and *Chaetopterus* tubes on the Eddystone Gnds. (M.B.A.); in trawl refuse Mevagissey and Falmouth!
35. *H. marphysae*, McIntosh. In chinks of the rocks, Polperro (McIntosh)
36. *Evarne impar*, Johnston. C. throughout the Plymouth area from between t-m. downwards (M.B.A.); Talland B. and under stones at Fowey (Thomas); in shells of bivalves, trawl refuse, Mevagissey, in laminarian roots and trawl refuse, Falmouth!
37. *Scalissetosus communis*, delle Chiaje. On shore at Mt. Edgcombe, in dredgings from Asia shoal (M.B.A.); in 20 fm. off Polperro (Thomas)
38. *S. assimilis*, McIntosh. On the oral region of *Echinus esculentus*, Eddystone Gnds. (M.B.A.); in trawl refuse, Mevagissey!
39. *Malmgrenia castanea*, McIntosh. N. unc. Plymouth commensal on *Spatangus esculentus*; occ. off Polperro, in Falmouth B., and in trawl refuse Mount's B. and Wolf Rock? also in 60 fm. off the Dodman; from 30 fm. off Polperro in the ambulacral grooves of *Astropecten irregularis* (Thomas)
40. *Halosydna gelatinosa*, M. Sars. On the shore under stones and occ. in deep water, Plymouth (M.B.A.); among laminarian roots near Polperro (Thomas) and at Helford! under stones between t-m. Marazion!
41. *Polynoe scolopendrina*, Sav. C. in tubes of *Polymnia nebulosa*, Asia shoal and Mt. Edgcombe (M.B.A.); one spec. on the Eddystone Gnds. (Hodgson); 2 in crevices of large stone from 10 fm. Polperro (Thomas)
42. *Acholoe astericola*, della Chiaje. Present in the ambulacral groove of most examples of *Astropecten irregularis* round Cornish coast; taken at Newquay and Padstow!
43. *Sthenelais boa*, Johnst. C. between t-m. on sand and esp. muddy sand, and in *Zostera* beds on S. coast; in 10 fm. off Polperro (Thomas), abund. 12 fm. off Pennance, Falmouth! Mount's B. (Allen)
44. *S. limicola*, Ehlers. Large specs. found by McIntosh in deepish water off Polperro; 2 by Thomas in same locality
45. *Pholoe minuta*, Fab. From Asia shoal and Queen's Gnd. Plymouth S. (M.B.A.); in rock pools, Polperro!
46. *Euphrosyne foliosa*, Aud. and Edw. Occ. specs. Asia shoal and Queen's Gnd., Plymouth, and on gravel round the Eddystone (M.B.A.); in crevices of stone from 18 fms. off Polperro (Thomas); several specs. at l. s. t. under stones, Gyllyngvase, Falmouth! a bright orange form sent in from Penzance!
47. *Eulalia viridis*, Müll. C. on rocky shores Plymouth S. and found on the Eddystone Gnds. (M.B.A.); one spec. on *fucus*, Mevagissey! at the roots of seaweed, Mount's B.!
48. *Eulalia punctifera*, Grube. On shore at Mt. Edgcombe, and in dredgings from Asia shoal and elsewhere in Plymouth S. (M.B.A.)
49. *E. aurea*, Gravin. C. in dredgings from Asia and Queen's Gnd., Plymouth S. (M.B.A.); Whitsand B. 8 fm. (Thomas)
50. *E. claparèdei*, de St. Joseph. N. unc. in dredgings from Asia shoal and occ. from Queen's Gnd. (M.B.A.)
51. *E. oblecta*, Ehlers. C. in dredgings Queen's Gnd.; occ. Asia shoal and elsewhere, Plymouth (M.B.A.); locally c. in 5 to 15 fm. Falmouth B.!
52. *E. ornata*, de St. Joseph. In dredgings from Asia shoal and Millbay Chan. (M.B.A.)
53. *E. pallida*, Claparède. V. c. in dredgings from Asia shoal and Queen's Gnd. Plymouth (M.B.A.); Whitsand B. and Polperro (Thomas)
54. *Pterocirrus macroceros*, Grube. Occ. specs. on Queen's Gnd, Plymouth (M.B.A.)
55. *Phyllodoce laminosa*, Sav. Between t-m. on Drake's Is. and Plymouth breakwater; in dredgings on Asia shoal and elsewhere (M.B.A.); among *Laminaria*, Polperro (Thomas); Mevagissey! Falmouth and Helford!
56. *P. maculata*, Müll. On the shore at Drake's Is., c. on Asia shoal (M.B.A.); in shallow water, Talland B. (Thomas); Helford, n. unc. near l. w-m. ! Mount's B. (R.Q.C.)
57. *P. rubiginosa*, de St. Joseph. C. in dredgings from Drake Is., Asia shoal &c., Plymouth (M.B.A.); Mevagissey and Gorran Haven!
58. *P. paretti*, Blainville. In trawl refuse Mevagissey!

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59. *Eteone picta*, Quatrefages. Queen's Gnd. and Barn Pool, Plymouth (M.B.A.)
60. *Tomopteris belgolandica*, Greef. In tow-nettings Plymouth (M.B.A.); Falmouth B., June 1900!
- 60A. *T. onisciformis*, Esch. Early stages, Scilly (Browne)
61. *Nereis cultrifera*, Grube. C. between t-m. in muddy gravel and sand along S. coast
62. *N. diversicolor*, O. F. Müll. C. in mud flats of the Tamar, Plym (M.B.A.), Fal and Helford! and on Par sands!
63. *N. dumerilli*, Aud. and Edw. C. at l. t. and in shallow water, Plymouth to Helford at least; Mount's B. (R.Q.C.)
64. *N. fucata*, Sav. In the topmost whorls of dead *Buccinum* shells, esp. those inhabited by *Eupagurus bernhardus*; Rame-Eddystone and Eddystone Gnds. (M.B.A.); 30 fm. off Polperro (Thomas); 40 fm. off the Dodman! at l. w. Gorran Haven! occ. specs. Falmouth B. from l. s. t. downwards!
65. *N. irrorata*, Malmgren. N. unc. Plymouth S. (M.B.A.); in sand between t-m. Whitsand B. and Polperro (Thomas); Pendower, Gyllyngvase and Helford!
66. *N. longissima*, Johnst. Occ. specs. in fine sand between t-m., Drake's Is. and Mt. Edgcombe (M.B.A.)
67. *N. pelagica*, Linn. N. unc. along S. coast among seaweed on rocky shores and in dredging from stony ground down to 60 fm.; also near Zennor, at Perranporth and Widemouth B.!
68. *Nephtys caeca*, Fab. Sandy shores Plymouth (M. B. A.) and Whitsand B. (Thomas); in 15 to 20 fm. Polperro and Falmouth B.! stray specs. occ. Gyllyngvase beach!
69. *N. bombergi*, Aud. et Edw. Between t-m. Plymouth and on the Eddystone Gnds. (M.B.A.); in sand Whitsand B., Gyllyngvase and Mount's B.! in trawl refuse Mevagissey!
70. *N. cirros*, Ehlers. In sand between t-m. Drake's Is. (M. B. A.)
71. *Eunice barassi*, Aud. et Edw. On shore and in dredgings Plymouth S. and on Rame-Eddystone Gnds. (M. B. A.); c. locally down to 30 fm. off Polperro (Thomas); in trawl refuse Mevagissey! c. Helford in shallow water!
72. *Onuphis conchilega*, M. Sars. On coarse shell gravel in 20 to 30 fm. S. of Rame Hd. and off the Eddystone (M. B. A.); in 60 fm. off the Dodman (Martin)
73. *Hyalinoecia tubicola*, Müll. C. on muddy gravel and sand 12 to 30 fm.; Rame-Eddystone and Eddystone Gnds. (M. B. A.); Looe (Thomas); Mevagissey! local in Falmouth B., but abund. Pennance and Helford!
74. *Marphysa sanguinea*, Mont. Often in crevices on rocky shores and under stones at l. w. Plymouth to Zennor
75. *M. belli*, Aud. et Edw. On the shore between t-m. on Drake's Is. (M. B. A.); n. unc. in *Zostera* beds, and occ. under stones as far W. as Mount's B.!
76. *Lysidice ninetta*, Aud. et Edw. C. Plymouth S. on shore and in dredgings (M. B. A.); occ. Whitsand B., 2 at l. w. Polperro (Thomas); Fowey! trawl refuse Mevagissey; shallow water Helford! 2 specs. Mousehole!
77. *Nematonereis unicornis*, Grube. Between t-m. Drake's Is. and Mount Edgcombe, and in dredgings from S. (M. B. A.); on shore, Teland B. and occ. 5 to 20 fm. off Polperro (Thomas); Gorran Haven and Falmouth B.!
78. *Lumbriconereis impatiens*, Claparède. On coarse grounds Eddystone-Rame, abund. Queen's Gnd. in spring 1903 (M. B. A.); Polperro; brought in from 60 fm. off the Dodman! v. c. 10 to 15 fm. off Helford!
79. *L. latreillei*, Aud. et Edw. On shore and in dredgings Plymouth S. (M. B. A.); Whitsand B. r.! around Polperro c. (Thomas); c. Falmouth B., occ. Falmouth Harb.!
80. *Maclovioa iricolor*, Mont. Occ. small specs. at l. w. from Plymouth to Helford
81. *Staurocephalus rubrovittatus*, Grube. Evidently local but n. unc. in shallow water on S. coast
82. *S. ciliatus*, Keferstein. Once from Queen's Gnd. Plymouth (M. B. A.), and once off Mevagissey!
83. *S. pallidus*, Langerhans. Dredged once on Asia shoal (M. B. A.)
84. *Ophryotrocha puerilis*, Clpd. et Meczn. Dredged once in quantity 5 to 8 fm., between Maenporth and Helford!
85. *Glycera convoluta*, Keferstein. Between t-m. Drake's Is.; in deepish water Rame-Eddystone and Eddystone Gnds. (M.B.A.); 30 fm. off Polperro (Thomas); under stones near l. w-m. Gorran Haven! 20 fm. Falmouth B.!
86. *G. lapidum*, Quatrefages. Near Queen's Gnd. and elsewhere in Plymouth S. (M. B. A.); between t-m. Talland B. (Thomas), and near Maenporth!
87. *G. gigantea*, Quatrefages. Between t-m. Drake Is. (M. B. A.)
88. *Goniada maculata*, Oersted. One spec. Plymouth breakwater (M. B. A.)
89. *Ephesia gracilis*, Rathke. Occ. near l. w. Plymouth to Helford; also 15 to 25 fm. off Polperro (Thomas); and in 20 fm. Falmouth B.!
90. *Scoloplos armiger*, Müll. In dirty sand and shale, at Rat Is. mouth of the Lynher, and in sand Drake's Is. (M. B. A.); c. in sand and decomposed shale along S. coast. In April, 1902, thousands of the stalked, brown, pear-shaped egg masses on the bar at Helford!
91. *Scolecopsis vulgaris*, Johnst. Numerous but very local, Plymouth (M. B. A.); on sand under *fucus* clumps near Mevagissey! in mud between t-m. Bar Pt., Falmouth Harb! up the Fal to Restronguet Creek!
92. *S. giardi*, Quatrefages. One spec. Plymouth (M. B. A.); with *S. vulgaris* in Falmouth Harb., but scarce!

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93. *Nerine cirratulus*, delle Chiaje. E. side Plymouth S. (M. B. A.); Falmouth B.; between t-m. on Mullion beach !
94. *N. coniocephala*, Johnst. On E. side Drake's Is. (M. B. A.); rather deep in the sand near l. w. Gyllyngvase !
95. *Anides oxycephala*, Sars. Devonshire side Plymouth district (M. B. A.); in *Zostera* Helford !
96. *Polydora ciliata*, Johnst. Boring in limestone of Plymouth Breakwater (M. B. A.); in soft mud tubes, St. Mawes and Helford !
97. *P. flava*, Claparède. In crevices and debris of shale, Rat Is. at mouth of the Lynher (M. B. A.); Mevagissey and Veryan B.!
98. *P. caeca*, Oersted. Eddystone Gnds. (M. B. A.); on a sponge from 60 fm. off the Dodman !
99. *P. boplura*, Claparède. Boring in the limestone of Plymouth Breakwater (M.B.A.)
100. *Poecilochaetus serpens*, Allen. Larvae in tow-nettings in Falmouth B. end of June, 1905.
101. *Chaetopterus variopedatus*, Renier. C. in muddy gravel Eddystone and Rame-Eddystone Gnds. (M.B.A.); occ. specs. along S. coast; c. 10 to 15 fm. off Pennance, Falmouth, and in shallow water off St. Martin's, Scilly !
102. *Magelona papillicornis*, Fr. Müller. Devonshire side of Plymouth district (M.B.A.). Deeply buried in sand between t-m. Gyllyngvase !
103. *Owenia fusiformis*, delle Chiaje. Devonshire side of Plymouth district (M.B.A.). In sand at 10 fm. Whitsand B. (Thomas); 3 specs. 15 fm. off Helford !
104. *Audouinia tentaculata*, Mont. C. locally in sand and gravel near h. w-m. Plymouth to Falmouth
105. *A. cirratus*, Müll. Under stones partly embedded in the sand, Gyllyngvase
106. *Dodecaceria concharum*, Oersted. Boring in limestone Plymouth Breakwater, abund. (M.B.A.); among the roots of *Laminaria*, Talland B. (Thomas)
107. *Amphitrite gracilis*, Grube. C. in sand between t-m. and between layers of shale, Plymouth S., including Mt. Edgcombe and Eddystone Gnds. (M.B.A.); local in Falmouth B.!
108. *A. johnstoni*, Malmgren. Under stones partly embedded in mud and muddy sand near Fowey (Thomas); Falmouth and Helford !
109. *Terebella lapidaria*, Kähler. C. in shale, Rum B. Plymouth (M.B.A.); tubes horizontally adherent to the under surface of stones partly embedded in muddy sand at Helford !
110. *Polymnia nebulosa*, Mont. Locally c. between t-m. in muddy and shaly sand from Mt. Edgcombe westwards; occ. Eddystone Gnds. (M.B.A.); 10 to 20 fm. off Polperro (Thomas) abund. 12 fm. off Pennance! n. unc. Falmouth Harb.
111. *P. nesidensis*, delle Chiaje. Between t-m. Mt. Edgcombe (M.B.A.), Fowey (Martin) and Helford ! dredged in shallow water Asia shoal and Cawsand B. (M.B.A.), Mevagissey and Falmouth B. !
112. *Lanice conchilega*, Pallas. C. on sandy shores along S. coast W. to Porthcurnow; Eddystone Gnds. (M.B.A.); r. 20 to 30 fm. off Polperro ! on stones and shells in trawl refuse from Falmouth B.; abund. at Helford (V.); Scilly
113. *Nicolea zostericola*, Oersted. Somewhat scarce, N. side, Drake's Is. (M.B.A.)
114. *N. venustula*, Mont. Occ. in 10 to 25 fm. off Gyllyngvase and at Bar Pt., Falmouth !
115. *Pista cristata*, Müll. One spec. dredged in shallow water off Helford !
116. *Thelepus concinnatus*, Fab. One spec. with tube attached to a valve of *Cyprina islandica* and covered with hydroids was found in trawl refuse Mevagissey!
117. *T. setosus*, Quatrefages. Dredged on Queen's Gnd. and Eddystone Gnds. (M.B.A.)
118. *Polycirrus aurantiacus*, Grube. Occ. Asia shoal Queen's Gnd. and Eddystone Gnds. (M.B.A.); c. 10 to 20 fm. off Polperro (Thomas); Mevagissey and locally c. Falmouth B.!
119. *P. caliendrum*, Claparède. In dredgings from Queen's Gnd. and Asia shoal (M.B.A.); Fowey (Martyn)
120. *Loimia medusa*, Sav. In shell gravel near l-w. Drake's Is. and on Queen's Gnd., Plymouth (M.B.A.); Polperro ! Fowey; Pentewan beach, Mount's B. and Porthcurnow !
121. *Terebellides stroemi*, Sars. One spec. 4 m. SW. by S. of Rame Hd. (M.B.A.); one in 12 fm. off Pennance, Falmouth, on muddy sand !
122. *Melinna adriatica*, v. Marinzeller. In soft mu from between t-m. downwards, c. in Plymouth S. (M.B.A.); occ. Fowey (Martyn), Falmouth Harb. and Helford !
123. *Amphicteis curvipalea*, Claparède. One spec. 4 m. SW. by S. of Rame Hd. (M.B.A.)
124. *Pectinaria (Lagis) Koreni*, Malmgren. C. S. of Batten Castle, Plymouth (M.B.A.); projecting from the sand at l.s.t. near Fowey (Martyn); once on the bar at Helford !
125. *P. (Amphicrene) auricoma*, Müll. Eddystone Gnds. (M.B.A.); once in trawl refuse Mevagissey!
126. *P. belgica*, Pall. Very sparingly from Gyllyngvase to Helford !
127. *Capitella capitata*, Fab. Usually under stones and shale sand about l.w.; Plymouth district (M.B.A.), Gerran's B. and Falmouth Harb.!
128. *Notomastus rubicundus*, Keferstein. Plymouth (M.B.A.); Fowey not infrequent (Martyn)
129. *N. latericeus*, Sars. Plymouth (M.B.A.); Fowey occ. at l.w. (Martyn)
130. *Ammotrypane aulogaster*, Rathke. Plymouth (M.B.A.); once in 20 fm. off Polperro !

MARINE ZOOLOGY

131. *Polyophthalmus pictus*, Dujardin. Plymouth (M.B.A.); scarce near l. w-m. Nare Pt., Helford!
132. *Arenicola marina*, Linn. Gen. dist. and locally abund. round coast and at Scilly between t-m.
133. *A. grubei*, Claparède. Drake's Is. and elsewhere in Plymouth S. (M.B.A.)
134. *A. ecaudata*, Johnst. Drake's Is. (M.B.A.); off Polperro (Thomas); Helford! in mud and sand between t-m. at Mount's B. (R.Q.C.)
135. *Sclerocheilus minutus*, Grube. Occ. Asia shoal (M.B.A.); once Falmouth B.!
136. *Stylarioides (Trophonia) plumosa*, Müll. Asia shoal and elsewhere in Plymouth S. (M.B.A.); 20 to 30 fm. off Polperro (Thomas); among laminarian roots Gorran Haven!
137. *Siphonostoma (Flabelligera) diplochaitos*, Otto. Once under stones at l.s.t. Pentewan!
138. *S. (Flabelligera) affinis*, M. Sars. Between t-m. on Drake's Is., under Rame Hd. and in dredgings from Queen's Gnd. (M.B.A.); between t-m. Polperro (Thomas); in deepish water off Mevagissey!
139. *Sabella pavonina*, Sav. Eddystone Gnds. (M.B.A.); sparingly off the bar at Helford!
140. *Branchiomma vesiculosum*, Mont. Drake's Is. and Barn Pool, Plymouth S. (M.B.A.); Fowey (Martyn); single specimens twice on the bar at Helford! at l.s.t. near Marazion!
141. *Dasychone bombyx*, Dalyell. Asia shoal, Queen's Gnd. and Eddystone Gnds. (M.B.A.); in muddy sand 12 fm. off Pennance, Falmouth! at l.s.t. near Marazion!
142. *Gbone infundibuliformis*, Kröyer. One spec., with the tube attached terminally to a small clinker near Helford!
143. *Potamilla reniformis*, Müll. One in an old oyster shell near mouth of Falmouth Harb.!
144. *P. torelli*, Malmgren. C. near mouth of Helford river
145. *Bispira volutacornis*, Mont. Plymouth (M.B.A.); in deep crevices at l.s.t. near Mevagissey, and at St. Michael's Mt. ! v. c. on Mawnan beach in 1901, but none found in 1905!
146. *Myxicola infundibulum*, Renier. N. side Drake's Is. and in Barn Pool (M.B.A.); c. in Helford river at l.s.t.!
147. *Serpula vermicularis*, Linn. Occ. Plymouth S., Rame-Eddystone and Eddystone Gnds. (M.B.A.); n. unc. down to 30 fm. off Polperro (Thomas); in trawl refuse Mevagissey and from 60 fm. off the Dodman! c. locally on stones, shells, and corallines down to 25 fm. in Falmouth B. ! Mount's B. and Sennen B.!
148. *Pomatoceros triquetus*, Linn. C. along S. coast between t-m. to 30 fm.; Whitsand B., Land's End! occ. on N. coast, and at Scilly!
149. *Hydroides norvegica*, Gunn. C. esp. on shells along S. coast; 20 fm. off Polperro, abund. (Thomas)
150. *Filograna implexa*, Berkeley. Occ. in trawl refuse and dredgings, Plymouth to Helford; abund. on the old piles, Penzance docks and pier; c. at Fowey (Martyn) and in Falmouth Harb.!
151. *Spirorbis borealis*, Daudin. C. almost everywhere on *Fucus*, stones, shells, &c.
152. *Protula tubularia*, Mont. Rame-Eddystone and Eddystone Gnds. (M.B.A.); Polperro (R.Q.C.); n. unc. in trawl refuse about Mevagissey, Falmouth and Helford! Mount's B. (R.Q.C.)
153. *Sabellaria alveolata*, Linn. C. irregularly along S. coast on rocks on sandy shores from Whitsand B. westward. The mound-like colonies reach their greatest development on N. coast, esp. on the outer rocks of the foreshore N. and S. of Polzeath sands and on Lundy beach, where they occ. reach a length of 4 or 5 ft. and a thickness of 1½ to 2½ ft.
154. *S. spinulosa*, Leuckart. Attached to shells, stones, and clinkers from Queen's Gnd., Asia shoal and Eddystone Gnds. (M.B.A.); 10 to 30 fm. off Polperro (Thomas), in trawl refuse from off Mevagissey! Falmouth, and Wolf Rk.; dredged occ. 20 to 25 fm. Falmouth B.!

MYZOSTOMARIA

1. *Myzostomum cirriferum*, Leuckart. C. sometimes abund. on *Antedon bifida* along S. coast, and at Scilly.

OLIGOCHAETA

1. *Clitellio arenarius*, Claparède. In mud at Drake's Is. and on the shores of Plymouth S. (M.B.A.); Falmouth Harb. and Helford!
2. *C. ater*, Claparède. In mud at Drake's Is. and on shores of Plymouth S. (M.B.A.); Falmouth Harb.!

GEPHYREA

1. *Petalostoma minutum*, Kefenstein. Plymouth (M. B. A.); Helford (Thomas)
2. *Phascolion strombi*, Mont. Frequent at intervals along the whole of the S. coast in shells of *Aporrhais pes-pelecani*
3. *Thalassema neptuni*, Gaert. C. Drake's Is. in stones from Asia shoal, Queen's Gnd. r. (M. B. A.); c. Polperro (Thomas); c. Falmouth B.; off the Lizard!
4. *Phoronis hippocrepia*, Wright. Abund. Plymouth S. and at times at least c. along S. coast to Mount's B.

HIRUDINEA

1. *Pontobdella muricata*, L. Occ. on the outside gnds. around Plymouth, parasitic on the skate (M. B. A.)

CHAETOGNATHA

1. *Sagitta bipunctata*, Quoy and Gaimard. In tow-nettings throughout the year and often abund.; Plymouth, Mevagissey, Falmouth, Mount's B. and Scilly

A HISTORY OF CORNWALL

BRYOZOA

In addition to Hincks, the principal county workers on this attractive group have been R. Q. Couch, Peach, Cocks, and the late Mr. Bernard Magor of Penzance. Couch, Peach, and Cocks recorded their observations in the works referred to in the introduction to the Hydroids (q. v.). Magor embodied his in a paper on 'The Polyzoa of West Cornwall' (*Trans. Penz. Nat. Hist. and Antiq. Soc.* new series, i, 1884). The examination of the Truro Collection is not yet completed.

1. *Actea anguina*, Linn. Evidently f. c. at intervals along the S. coast, Plymouth to Porthgwarra; occ. cast up in quantity at St. Ives, and in Oct. 1904 at Padstow! local at Scilly
2. *A. recta*, Hincks. F. c. on Rame-Eddystone Gnds. (M. B. A.), c. Polperro, Gorran (R. Q. C.), and off the Dodman (P.); once at Scilly!
3. *A. truncata*, Landsborough. Cast up on an oyster shell at St. Ives in autumn 1903!
4. *Eucratea chelata*, Linn. Gen. dist. along S. coast; abund. St. Ives and occ. at Newquay, Padstow, and at Scilly!
5. *Gemellaria loricata*, Linn. Polperro (R. Q. C.) and at Gorran Haven (P.)
6. *Scrupocellaria reptans*, Linn. Evidently abund. all round coast and at Scilly
7. *S. scrupaea*, Busk. Off St. Ives on stones (H.)
8. *S. scruposa*, Linn. C. along S. coast; St. Ives, Padstow and Cowrie Haven near Bude!
9. *Caberea Ellisii*, Flem. R. Q. Couch found a single but typical spec.; off the Runnelstone (Magor)
10. *C. Boryi*, Audouin. One spec. found by Peach at Gorran Haven, one by Magor at Lamorna Cove and one also by Magor in Crow S. Scilly
11. *Bicellaria ciliata*, Linn. F. c. in Plymouth district (M. B. A.); n. unc. at Fowey; only occ. further W.; twice at Scilly
12. *Bugula avicularia*, Linn. Eddystone and Rame-Eddystone Gnds. (M. B. A.); single specs. at Mevagissey and Mount's B.; Helford! off the Lizard and Porthgwarra (Magor)
13. *B. flabellata*, J. E. Gray. C. Plymouth S. and occ. on the Eddystone Gnds. (M. B. A.); one spec. off Porthgwarra (Magor)
14. *B. plumosa*, Pallas. C. Plymouth (M. B. A.); r. on rocky ground, Polperro (R. Q. C.); Falmouth (Miss Warren)
15. *B. turbinata*, Alder. F. c. in dredgings Plymouth S. (M. B. A.); Falmouth (Cocks); on stone off Porthgwarra (Magor); on driftwood Perranporth!
16. *Beania mirabilis*, Johnst. Falmouth on crab float (Cocks); Mount's B. on *Laminaria* at l. w. (R. Q. C.); off Scilly on valve of *Pecten maximus* (McAndrew)
17. *Flustra foliacea*, Linn. C. along S. coast; Scilly and St. Ives
18. *F. papyracea*, E. and S. Queen's Gnd. Plymouth (M. B. A.); single specs. 8 leagues S. of the Dodman, off the Dodman (P.), and off Porthgwarra (Magor)
19. *F. securifrons*, Pallas. One spec. sent by Baily from Sennen!
20. *F. carbacea*, E. & S. Three small specs. sent by Baily from Sennen!
21. *Membranipora aurita*, Hincks. On stones and shells off the Cornish coast (H.)
22. *M. catenularia*, Jameson. On almost every *Pinna* drawn from deep water off the Dodman Pt. and W. to the Lizard (R. Q. C.); Eddystone Gnds. (M. B. A.); W. of Menavawr, Scilly!
23. *M. curvirostris*, Hincks. The type spec. obtained 10 or 12 m. S. of Polperro in 40 fm.; Eddystone Gnds.
24. *M. dumerili*, Audouin. Eddystone Gnds. (M. B. A.); off the Dodman, 60 fm. (H.)
25. *M. Flemingi*, Busk. Eddystone Gnds. (M. B. A.); off Porthgwarra (Magor); Land's End district (R. Q. C.)
26. *M. flustroides*, Hincks. Off the Dodman, 60 fm. (H.)
27. *M. spinifera*, Johnst. Locally c. on S. coast on stones, shells, and laminarian roots between t-m.
28. *M. craticula*, Alder. C. on stones in beach pools at Whitsand B., Polperro, Gorran Haven, Fowey (R. Q. C.); in deep water off the Dodman (P.)
29. *M. imbellis*, Hincks. On shells and stones from deep water off the Dodman (H.)
30. *M. lacroixi*, Audouin. N. unc. on mussels Plymouth to Newquay; abund. on dead oyster and mussel shells in the Fowey, c. in the Fal
31. *M. hexagona*, Busk. Fowey Harb. and off the Dodman on an ascidian (P.)
32. *M. lineata*. C. locally between t-m. along the S. coast; St. Ives, Newquay, and Scilly!
33. *M. membranacea*, Linn. Gen. dist. and abund. on *Laminaria digitata* round coast and at Scilly
34. *M. pilosa*, Linn. Abund. round coast and at Scilly on stones, shells, and esp. on *fuci* and corallines
35. *M. rosselii*, Audouin. On Queen's Gnd. and Cawsand B., Plymouth (M. B. A.); Fowey Harb. and off the Dodman, r. (P.); Helford!
36. *M. nodulosa*, Hincks. One spec. sent in by Baily from Mount's B.!
37. *Micropora coriacea*, Esper. In deep water, Cornwall (H.); on shell in Fowey Harb. and at Gorran Haven (P.)
38. *Steganoporella Smittii*, Hincks. Founded on two specs. encrusting a *Serpula* found by Peach in deep water off the Cornish coast, one near Gorran Haven

MARINE ZOOLOGY

39. *Cellaria fistulosa*, Linn. C. and in places abund. round coast from shallow to very deep water; Falmouth to Lisbon cable from 89 to 205 fm.; Scilly
40. *C. salicornioides*, Lamouroux. Eddystone Gnds. (M. B. A.)
41. *C. sinuosa*, Hassall. C. at least locally along S. coast; gen. with *C. fistulosa*
42. *Cribrilina figularis*, Johnst. Off Cornwall, 30 to 60 fm. (H.); Eddystone Gnds. (M.B.A.); twice off the Dodman (P.)
43. *C. annulata*, Fab. Cornwall (H.); sent in by Baily on *Laminaria* from Mount's B!
44. *C. punctata*, Hassall. On stones and algae between t-m. in Mount's B.
45. *C. radiata*, Moll. In 60 fm. off Cornish coast, both *radiata* and *innominata* forms (H.); Rame-Eddystone and Eddystone Gnds. (M. B. A.); Fowey and Mount's B.; off Polperro (Magor)
46. *Membraniporella nitida*, Johnst. N. unc. along S. coast between t-m. on stones, shells, laminarian roots, and polyzoa
47. *Microporella ciliata*, Pallas. N. unc. on *Laminaria*, limpets, dead shells and stones from between t-m. to deep water along S. coast and at Scilly; 60 fm. off the Dodman (H.). Var. *personata* also occurs (H.)
48. *M. impressa*, Audouin. N. unc. along coast on red seaweeds, shells, and stones, Plymouth to Mount's B.; usually littoral, but found by Hincks in 60 fm. off the Dodman
49. *M. malusii*, Audouin. On S. coast n. unc., but not found W. of the Dodman
50. *M. violacea*, Johnst. Eddystone Gnds. (M.B.A.); off Fowey and off the Dodman (P.)
51. *Diporula verrucosa*, Peach. The type spec. is a fragment obtained by Peach in Lantivet B.
52. *Lepralia foliacea*, E. & S. F. c. Plymouth S., and on all the outside gnds. (M.B.A.); occ. off the Dodman (R. Q. C.); Falmouth B. (Miss Vigurs); Porthgwarra (Magor); off the Runnelstone; occ. at Scilly!
53. *L. pallasiana*, Moll. F. c. on small stones between t-m. along S. coast and at Padstow!
54. *L. pertusa*, Esper. Eddystone Gnds. (M.B.A.); found by Peach off Fowey and the Dodman
55. *L. edax*, Busk. Peach got altogether five specs. off the Dodman, each covering a small *Nassa*
56. *Umbonella verrucosa*, Esper. Drake's Is. (M.B.A.); between t-m. at Polperro and in 40 fm. off the Dodman (H.); Gorran (P.); Falmouth B. Mount's B., off Land's End, Padstow! and Scilly
57. *Chorizopora brongniarti*, Audouin. N. unc. from l. s. t. to deep water (60 fm. off the Dodman) Rame-Eddystone Gnds. (M.B.A.) to Gorran Haven
58. *Porella concinna*, Busk. Locally f. c. in deep water (60 fm. off the Dodman), Eddystone Gnds. to Gorran Haven
59. *Porella compressa*, Sow. C. in deep water from Polperro to Gorran Haven (R.Q.C. & P.); Land's End district (R. Q. C.)
60. *P. laevis*, Fleming. In deep water off the Dodman and in the Land's End district (R.Q.C.); on a stone 4 in. in diameter, with 4 spec. of *Caryophyllea Smithii*, dragged up off the Lizard (V.)
61. *Smittia cheilostoma*, Manzone. In deep water, Cornwall (H.); Eddystone Gnds. (M. B. A.)
62. *S. reticulata*, Macgillivray. One of the most abund. species on the Cornish *pinnae* from 60 fm. (H.); on stone off the Dodman (P.); on stone in crab-pot, Porthgwarra (Magor); occ. Scilly!
63. *S. Landsborovii*, Johnst. On *Sertularia abietina* in 30 fm. (H.); off the Dodman (P.); Mount's B. (R. Q. C.), Newquay!
- [*S. marmorea*, Hincks. Probably from Cornwall (H.)]
64. *S. trispinosa*, Johnst. N. unc. from inshore to 60 fm. (H.), Eddystone Gnds. (M. B. A.) to Falmouth B.
65. *Phylactella labrosa*, Busk. Off Fowey and 5 m. off the Dodman (P.)
66. *P. collaris*, Norman. Eddystone Gnds. (M. B. A.)
67. *P. eximia*, Hincks. One spec. off the Dodman (P.)
68. *Mucronella Peachii*, Johnst. Eddystone Gnds. (M. B. A.); Falmouth B.; on whelk shells in crab-pot, Porthgwarra (Magor)
69. *M. ventricosa*, Hassall. Rame-Eddystone and Eddystone Gnds. (M. B. A.); off the Dodman (P.); Falmouth B.; Mount's B. (R. Q. C.)
70. *M. variolosa*, Johnst. Eddystone Gnds. (M. B. A.); 60 fm. off the Dodman on *Pinnae* (H.); from same locality and coast gen. (P.); Land's End district (R. Q. C.)
71. *M. coccinea*, Abildgaard. A c. littoral species along S. coast and at St. Ives, Newquay, Padstow! and Scilly. Var. *mamillata* (Hincks) n. unc.
72. *Palmicellaria skenei*, E. & S. Eddystone Gnds. (M. B. A.); off Polperro (H.); on stones and *Pinnae* off the Dodman, r. (R. Q. C.); off Porthgwarra (Magor)
73. *Rhynchozoon bispinosum*, Johnst. Eddystone Gnds. (M. B. A.); on stones in 60 fm. off the Dodman (H.)
74. *Retepora couchii*, Hincks. On a stone off Land's End (R. Q. C.); on a large stone found by Laughrin in 40 fm. off Polperro (H.); probably from Scilly by Borlase (*Cornish Fauna*, iii, 130)
75. *Hippothoa distans*, Macgillivray. From Cornwall in Hyndman's dredgings on stones from deep water (H. & P.); Land's End? (R. Q. C.)
76. *H. divaricata*, Lamouroux. One spec. Queen's Gnd., Plymouth; Rame-Eddystone and Eddystone Gnds. (M. B. A.); other records may be *H. distans*
77. *Schizoporella armata*, Hincks. Type spec. obtained on stones in 30 fm. off Polperro

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78. *Schizoporella auriculata*, Hassall. From l. s. t. to deep water, 60 fm. (H.); Eddystone Gnds. (M.B.A.); Mount's B. 5 fm.; Scilly (McAndrew). Var. *ochracea*, Hincks, 30 fm. off the Cornish coast (H.); off the Dodman (P.)
79. *S. ceciliae*, Audouin. Eddystone, 20 fm. (M. B. A.); coast of Cornwall, on stone, &c., from deep water (H.)
80. *S. hyalina*, Linn. Gen. dist. and usually abund. along the coast from inshore to deep water on stones, shells, and sea-weed, from the smallest up to *Laminaria saccharina*; Scilly
81. *S. vulgaris*, Moll. SW. of Polperro, 30 fm. (H.)
82. *S. linearis*, Hassall. Gen. dist. and abund. round coast, l. w. to 60 fm.
83. *S. sanguinea*, Norman. On stones, Cornwall, deep water (H.)
84. *S. spinifera*, Johnst. N. unc. on *Laminaria* and stones along S. coast, but not recorded W. of Gorran Haven.
85. *S. unicornis*, Johnst. Locally c. along coast from between t-m. to deep water; abund. Fowey Harb., off the Dodman (P.), Falmouth B., and Mount's B. The form *ansata* occurs off Cornwall, 30 to 40 fm. (H.)
86. *Mastigophora dutertrei*, Audouin. Off the Dodman, 60 fm. (H.); one spec. in the same locality (P.)
87. *Schizotheca fissa*, Busk. Eddystone Gnds. (M.B.A.); off the Dodman, 30 to 40 fm. (H.); on a stone 5 m. off the Dodman (P.)
88. *Cellepora avicularis*, Hincks. Locally c. from moderate to very deep water on *Sertulariae*, *Gorgoniae*, &c.; Eddystone Gnds. (M.B.A.); off the Dodman (P.); W. of Menavawr, Scilly!
89. *C. costazii*, Audouin. N. unc. on S. coast from the laminarian zone downwards; Cawsand B., Polperro, Gorran Haven, Helford, Mount's B.
90. *C. armata*, Hincks. On shell probably from deep water, Cornwall (H.)
91. *C. dichotoma*, Hincks. In 20 to 30 fm. at the Eddystone (M. B. A.); off Polperro, 30 fm. (H.); off the Dodman (P.); Padstow!
92. *C. pumicosa*, Linn. N. unc. from l. s. t. to deep water along the S. coast; St. Ives, Padstow, and Scilly!
93. *C. ramulosa*, Linn. N. unc. on corallines, stones, &c., from deepish water along S. coast; Newquay and Padstow!
94. *Crisia aculeata*, Hassall. N. unc. at l. s. t. on red sea weed in Falmouth B.!
95. *C. cornuta*, Linn. F. c. from between t-m. downwards apparently all round coast and at Scilly on seaweeds, zoophytes and the Cor-wich crab
96. *C. denticulata*, Lamarck. N. unc. along coast and at Scilly from l. w-m. to the laminarian zone
97. *C. eburnea*, Linn. C. round coast and at Scilly, from between t-m. downwards chiefly on red sea-weeds, *Sertulariae* and the Cor-wich crab
98. *Crisia ramosa*, S. F. Harmer. V. c. Plymouth district, 4 to 30 fm. gen. on stones, but also on shells, red sea-weeds, &c. (M.B.A.); Falmouth B.
99. *Diastopora obelia*, Johnst. Gen. dist. round coast shallow to deep water; specs. exposed at l. s. t., Falmouth B.
100. *D. patina*, Lamarck. N. unc. deep water along S. coast and at Scilly; Newquay, Padstow!
101. *D. sarniensis*, Norman. Rame-Eddystone and Eddystone Gnds. (M.B.A.); 40 fm. off Polperro (H.); Lantivet B. on *Isocardia cor.* (P.)
102. *D. suborbicularis*, Hincks. Eddystone Gnds. (M.B.A.)
103. *Entalophora clavata*, Busk. Wolf Rk. (P); Porthgwarra (Magor)
104. *Idmonea serpens*, Linn. Locally c. along S. coast from between t-m. downwards. Var. *radiata* on Cornish Pinnæ (H.)
105. *Tubulipora liliacea*, Pallas. N. unc. on shells, stones, hydroids, &c. S. of the Plymouth Break-water, 15 to 30 fm.; Rame-Eddystone Gnds.; Eddystone Gnds. (M.B.A.); Falmouth B.
106. *T. phalangea*, Couch. C. along coast from shallow water downwards on stones, shells, wicker-work of crab-pots and in the hollow 'bulbs' of *Laminaria bulbosa*; abund. Scilly
107. *T. plumosa*, W. Thompson. Abund. Plymouth district on *Cystoseira granulata* and on *Saccorbiza bulbosa* (M.B.A.), Mevagissey!
108. *Stomatopora granulata*, Milne-Edwards. From deep water, Eddystone Gnds. (M.B.A.), off the Dodman, in Falmouth B.!
109. *S. johnstoni*, Heller. Eddystone Gnds. (M.B.A.)
110. *S. major*, Johnst. N. unc. locally on stones and shells in deep water; Eddystone Gnds. (M.B.A.); Polperro, Land's End (R.Q.C.); Falmouth B.!
111. *S. incrassata*, Smitt. On *Pinna* from deep water, Cornwall (H.)
112. *S. deflexa*, Couch. On shells from deep water; Polperro, Mevagissey B. and off the Dodman (R.Q.C.)
113. *S. fungia*, Couch. On shells and stones c. Eddystone to the Dodman (R.Q.C.); 40 fm. off Polperro (H.); Land's End (R.Q.C.)
114. *Lichenopora hispida*, Fleming. C. deepish water all along S. coast
115. *Alcyonidium gelatinosum*, Linn. N. unc. deep water, Plymouth to Land's End
116. *A. hirsutum*, Fleming. On algae from between t-m. to shallow water; one spec. from Cawsand B. (M.B.A.); Polperro, Mevagissey (R.Q.C.); n. unc. Pennance, Falmouth! abund. Mount's B. (Magor), Padstow!
117. *A. mytili*, Dalyell. Plymouth (M.B.A.) and Mount's B. (H.)
118. *A. parasiticum*, Fleming. Plymouth on *S. cupressina* (M.B.A.); Fowey and Falmouth B. on *S. abietina* and *Hydrallmania falcata*

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119. *Flustrella hispida*, Fab. V. abund. round coast and at Scilly on *fuci* between t-m.
120. *Vesicularia spinosa*, Linn. Off the Dodman on corallines, r. (R.Q.C.)
121. *Amathia lendigera*, Linn. Locally n. unc. on *fuci* and corallines esp. about l. s. t-m.; Penlec-Rame Gnds. (M.B.A.); Polperro, Lantivet B. (R.Q.C.); Gorran Haven (P.); Falmouth B., Mount's B. and Scilly!
122. *Bowerbankia imbricata*, Adams. On *fuci* about l. w-m.; Polperro, (R.Q.C.); Helford! and St. Ives
123. *B. pustulosa*, E. and S. On *fuci* about l. s. t.; Plymouth v. c. (M.B.A.); Fowey Harb. and off Gorran Haven, rr. (P.); one dense arborescent tuft at Pennance, Falmouth!
124. *Cylindroecium giganteum*, Busk. On rocks near l. w. off Gorran Haven and the Dodman (P.)
125. *C. dilatatum*, Hincks. Eddystone Gnds. (M.B.A.); Falmouth (Mann)
126. *Hypophorella expansa*, Ehlers. N. unc. Plymouth area on the tubes of *Chaetopterus variopedatus* (M.B.A.)
127. *Triticella boeckii*, G. O. Sars. One spec. on *Gonoplax rhomboides* on the Rame-Eddystone Gnds. (M.B.A.)
128. *Valkeria uva*, Linn. Often abund. on corallines in rock pools along coast. The form *uva* locally v. c. The form *cuscuta* occurs on most beaches down to the laminarian zone
129. *Mimosella gracilis*, Hincks. Locally c. in laminarian zone along S. coast; Polperro, Gorran Haven (R.Q.C.); Falmouth B. ! Mount's B. and elsewhere (P.)
130. *Pedicellina cernua*, Pallas. Gen. dist. and plentiful E. of S. coast, but evidently scarce in the middle and not recorded W. of Falmouth B.; between t-m. to deepish water, more esp. on hydroids, algae and other polyzoa
131. *P. gracilis*, Sars. On *Laminaria* at l. t-m. near Zennor!

BRACHIOPODA

1. *Megathyris decollata*, Chemnitz. Dredged at Scilly by the late Clifford Burkill about $1\frac{1}{2}$ m. NE. of Menavawr in 35 fm. He obtained 3 dead specs. and 2 single valves
2. *M. cestellula*, S. V. Wood. Single valves dredged at Scilly by Burkill in 40 fm.; obtained also by Marshall, 30 fm. off the Eddystone

MOLLUSCA

From its geographical position, its variety of coast line and of littoral, its diversity of sea-bottom, and the relatively equable temperature of its waters, Cornwall is peculiarly rich in molluscan life. The local workers, too, have been numerous, and though the published lists have been few, the results of their observations are in most cases still preserved in the collections they have made. Among the earliest investigators in this fascinating field were Jonathan Couch, the famous naturalist surgeon of Polperro, W. P. Cocks of Falmouth, and Williams Hockin of Truro, all of whom published local lists of great value. Later on Miss Hannah Tyacke and Miss E. Carne of Penzance, Miss Hockin of Phillack, the Rev. R. N. Dennis of Penzance, and the Rev. W. Rogers collected assiduously and for many years in the west of the county, and their results, along with those of Mr. E. D. Marquand, Mr. W. E. Baily, and Mr. Theodore Brown, and those of the Rev. R. W. J. Smart among the Isles of Scilly, were brought together and considerably augmented by Mr. G. Fox Tregelles in his paper on 'The Marine Testaceous Mollusca of Cornwall' (*vide infra*). This list also contains a number of data by Mr. R. V. Tellam from the St. Minver district and Par, as well as many compiled from the records of older visiting naturalists, like Montagu, Barlee, Jeffreys, and McAndrew. In the early eighties the Rev. R. W. J. Smart and the Rev. A. H. Cooke gave a great deal of attention to the marine shells of Scilly, and much also has been done there and along the south coast of the county by Messrs. C. Burkill and J. T. Marshall.

The more important papers on Cornish marine mollusca are as follows:—1. Jonathan Couch, *Cornish Fauna*, 1841. As pioneer work this list is admirable. 2. W. P. Cocks, 'Fauna of Falmouth' (*Rep. Roy. Cornw. Polyt. Soc.* 1849). 3. 'List of Shells, Mount's Bay, 1855' (*Trans. Penz. Nat. Hist. and Antiq. Soc.* (old ser.), ii). This is evidently the work of several naturalists, but their names have not been preserved. In the accompanying list of county species it is referred to as the 'Penzance List.' 4. Williams Hockin, 'Cornish Marine Shells' (*Journ. Roy. Inst. Cornw.* 1866). 5. G. Fox Tregelles, 'Marine Testaceous Mollusca of Cornwall' (*Trans. Penz. Nat. Hist. and Antiq. Soc.* (new ser.), ii, 1885). 6. The Rev. R. W. J. Smart, M.A., and the Rev. A. H. Cooke, M.A., 'Marine Shells of Scilly' (*Journ. of Conchology*, 1885 and 1886). This paper gives the results of four years' close shore hunting and a limited amount of dredging among the islands. It also contains a list of mollusca recorded from Scilly by the Rev. J. H. Jenkinson and his son Mr. F. Jenkinson, but not found by the authors. 7. C. Burkill and J. T. Marshall, 'Marine Shells of Scilly' (*Journ. of Conchology*, 1885 and 1886). These contain an account of species, previously unrecorded from the islands, obtained by Mr. C. Burkill and identified by Mr. J. T. Marshall. 8. W. Garstang, M.A.,

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'Opisthobranchiate Mollusca Found at Plymouth' in the *Journ. Marine Biol. Assoc.* (1890). 9. G. Fox Tregelles, 'The Marine Mollusca of Cornwall' (*Journ. of Conchology*, 1896). This is by far the most complete list of species with their distribution around the county that has yet appeared, and includes practically all the previous records. 10. J. T. Marshall, 'The Marine Shells of Scilly' (*Journ. of Conchology*, 1897). This consists of an additional list of Scillonian species obtained by the author. 11. 'Plymouth Marine Invertebrate Fauna' (*Journ. Marine Biol. Assoc.* vii). This list includes all the more prominent forms of marine mollusca from the district, but is incomplete as regards the smaller and more critical species.

In addition to the data from these various published papers the list that follows contains all the more important records of the Nature Study Society at the Technical Schools, Truro, during five years' ardent shore collecting by many of its members. A considerable amount of dredging has also been done on the south coast, but especially in Falmouth Bay and in 35 to 45 fathoms off the Dodman, and a great deal of attention given to trawl refuse wherever it has been available. Mr. A. Robinson has very kindly supplied the writer with a MS. list of his takings around Polperro, Mr. C. P. Richards of species obtained in the St. Austell district, Mr. J. H. James of those he has taken in the Truro, Falmouth and Helston districts as well as elsewhere in the county, Mr. Rupert Vallentin of those found by him around Falmouth, and Mr. F. W. Thelwell of those secured by him at Harlyn Bay, near Padstow. The collections of Cornish shells in the museum of the Royal Institution of Cornwall, of Mrs. Paull at Bosvigo, Truro, and of Mr. J. H. James, have been of great service in the preparation of this section of the work, and much labour has been saved to the writer through the kindness and thoughtfulness of Mr. G. F. Tregelles in lending him a carefully annotated copy of his 'Marine Mollusca of Cornwall.' The records of critical species and varieties in the following list are for the greater part limited to specimens that have been identified by Mr. J. T. Marshall, the Rev. A. H. Cooke, and the late Mr. Robert Bell, so that their geographical distribution in the county is in many cases undoubtedly wider than the number of localities mentioned would suggest. Where there is uncertainty about any particular record the doubt is always indicated in the text.

LIST OF CORNISH MARINE MOLLUSCA

AMPHINEURA

1. *Rhopalomenia aglaophenia*, Kov. & Mar. Occ. twined round the base of the stem of the hydroid *Aglaophenia myriophyllum*; c. Eddystone and Rame-Eddystone Gnds. (M.B.A.); off the Dodman! in 35 fm. Falmouth B.!
2. *Myxomenia banyulensis*, Pruvot. Often associated with the erect form of *Lafœa dumosa*; Eddystone Gnds. (M.B.A.); off the Dodman!
3. *Lepidopleurus cancellatus*, G.B. Sow. Scarce at Falmouth and Helford; St. Mary's S., Scilly (M.)
4. *Hanleya hanleyi*, Bean. Falmouth (Cocks); a perfect example and several plates in St. Mary's S., Scilly (M.)
5. *Tonicella rubra*, Lowe. Falmouth (Cocks); Mount's B. (Penzance List)
6. *Callochiton laevis*, Mont. N. unc. under stones near l. w - m., Plymouth S.; Fowey, Falmouth, Helford, Mount's B., Land's End, and St. Mary's S., Scilly
7. *Craspidochilus onyx*, Spengler. N. unc. along the S. coast and in places abund. from l. w-m. to deepish water; Hayle, Padstow, and n. unc. in the Menavawr dredgings at Scilly. var. *rissoi* Jeffreys, found at Scilly by Marshall
8. *C. cinereus*, Linn. Under loose stones between t-m. in Plymouth S.; and at Fowey, Portscatho, Falmouth, Mount's B. (Tregelles) and Scilly
9. *C. albus*, Linn. Under stones between t-m. on Porthpean beach, St. Austell (Richards); dredged in shallow water near Helford!

10. *Acanthochites fascicularis*, Linn. Under stones and among barnacles down to l. s. t.; probably all along the S. coast from Whitsand B. to Mousehole; not recorded from the Lizard; Falmouth and Scilly, r.
11. *A. discrepans*, Brown. Lantivet B. (J.C.), Falmouth, Helford and Mount's B. r.

PELECYPODA

PROTOBRANCHIA

12. *Nucula nucleus*, Linn. Locally c. from 10 fm. downwards round the coast; shells cast up along S. and at Hayle, Perranporth, St. Minver, Bude! live specs. Cawsand B. and Eddystone Gnds. (M.B.A.), off the Dodman, 40 fm. ! in Falmouth Harb. 15 fm. (V.) and at Scilly; var. *radiata*, F. & H. Falmouth (Hockin) and in Mount's B. (Tregelles)
13. *N. nitida*, G. B. Sow. Cawsand B. and 'outer' trawling gnd. at the Eddystone (M.B.A.); 40 fm. off the Dodman! 15 fm. at Helford! Falmouth (Cocks), Mount's B. (Penzance List), Porthcurnow! Wolf Rk. and Hayle (Miss Carne)

FILIBRANCHIA

14. *Anomia ephippium*, Linn. V. gen. dist. on S. coast and at Scilly, between t-m. down to 20 or 30 fm. on rocks, stones and shells; Hayle, Perranporth! Harlyn B. (Thelwell) and Padstow B. ! var. *squamula* Linn. Land's End (Hockin); Scilly (S. & C.). var. *aculeata* Müll. Land's End (R.Q.C.); Scilly (S. & C.)

MARINE ZOOLOGY

15. *A. patelliformis*, Linn. Eddystone Gnds. (M.B.A.) ; Falmouth ; off Helford 15 fm. ! Mount's B., Land's End, Wolf Rk. (Miss Carne), Hayle, Scilly (M.). var. *striata* Lov. Falmouth (Hockin)
 16. *Glycimeris glycimeris*, Linn. C. locally on sandy and muddy gravels from just beyond l. s. t. to 40 fm. ; dead shells all round coast to Bude and at Scilly ; live specs. c. on Queen's Gnd., Cawsand B., Rame-Eddystone and Eddystone Gnds. (M.B.A.), Polperro and Gorran Haven ; off the Dodman, in 40 fm. and Falmouth B., 15 fm. downwards ! Mount's B., 5 to 20 fm., and at Scilly, esp. in 40 fm. on stony ground. var. *pilosa* Linn. Helford (Hockin)
 17. *Limopsis aurita*, Brocchi. Two unpaired valves, Gorran Haven, 16 March, 1904 !
 18. *Barbatia lactea*, Linn. Irregularly dist. between t-m., Plymouth to Bude ; also in 5 fm. Queen's Gnd., Plymouth, in 15 fm. Falmouth Harb. ! in 20 fm. and over, Mount's B. ; occ. in 40 fm. dredgings at Scilly
 19. *Arca tetragona*, Poli. Rather sparingly dist. along S. coast in crevices and among stones from l. w. downwards ; Hayle r. ; a single valve Harlyn B. (Thelwell) ; at Scilly single valves abund., live specs. occ. on stones from 40 fm.
 20. *Mytilus edulis*, Linn. Gen. dist. and abund. all round coast ; Scilly, but n. c. and always solitary and small. var. *ungulata* Linn. Hayle (Miss Hockin), St. Minver (Tellam). var. *incurvata* Penn. Gorran Haven, Falmouth (Cocks), Newquay, St. Minver (Tellam). var. *galloprovincialis* Lmk., at Par, Falmouth (Cocks), Helford, Hayle (Dennis). var. *pellucida* Penn. at Falmouth, Maenporth (Dennis) Helford, Hayle and Newquay. var. *flava* Poli, at Newquay (Miss Hockin). var. *pallida* Marshall, at St. Austell (Richards), Newquay (James), Porth (Richards)
 21. *Volva modiolus*, Linn. Occ. thrown up at Par, Falmouth, Helford, St. Minver, and Scilly
 22. *V. barbata*, Linn. From under boulders between t-m. to deep water ; a littoral and shallow water species at Plymouth (M.B.A.) ; 15 fm. Falmouth B. ! Mount's B. (Tregelles) ; Padstow ! several valves at Bude ! very small specs. dredged outside Menavawr, Scilly, often on sea-weed (S. & C.).
 23. *V. adriatica*, Lmk. Occ. cast up at Falmouth and at Helford, Mount's B. (Penzance List) and Hayle ; at Scilly, dredged off Menavawr in a nest or case (S. & C.), and occ. cast ashore dead ; var. *ovalis* Sow, at Falmouth (Tregelles), Helford (M.R.I.) and Pentle B. Scilly (S. & C.)
 24. *V. phaseolina*, Philippi. Occ. alive above l. w-m., but evidently c. locally, from 15 fm. downwards ; outside gnds. Plymouth 15 to 30 fm. (M.B.A.) ; Fowey Harb. ; in 20 fm. Falmouth B. ! 15 to 25 fm. Mount's B., Land's End (T. Brown), Wolf Rk. (Baily), Hayle, and a single valve from Harlyn B. (Thelwell) ; from the Menavawr dredgings at Scilly small but numerous (C. Jeffreys)
 25. *Modiolaria marmorata*, Forbes. Chiefly in the tests of tunicates at 5 to 25 fm., n. unc. ; abund. in 20 fm. about 2 miles SE. of Looe (Robinson), in 10 to 15 fm. Falmouth B., and occ. in 5 fm. off Helford ! Mount's B., Porthcurnow, Land's End (Hockin), Hayle, Harlyn B. (Thelwell) ; a few single valves at Scilly
 26. *M. costulata*, Risso. Almost always on sea-weed in dredgings and trawl refuse from shallow water to 40 fm. ; dead shells cast up occ. from Falmouth to Hayle ; a single valve at Harlyn B. (Thelwell), 2 at Bude ! in trawl refuse at Mevagissey and Porthloe, in 40 fm. off the Dodman, in 10 fm. off Helford ! deepish water, Scilly
 27. *M. discors*, Linn. Among short sea-weed between t-m., and occ. in trawl refuse ; Gorran Haven ! Falmouth, gen. dead shells ; c. Helford (James), Mount's B. ; Porthcurnow (Miss Hockin) ; Wolf Rk. (Baily) ; Harlyn B., 4 specs. (Thelwell) ; Bude, 3 valves ! St. Mary's, Scilly, between t-m. var. *semilaevis* Jeff., obtained by Burkill at Penzance
- [*M. discrepans*, Leach. Spec. in the museum of the Royal Institution of Cornwall, labelled 'Whitsand Bay']
28. *Crenella rhombea*, Berk. Evidently always from deep water ; Mount's B. (Penzance List) ; dredged 20 m. off Penzance (McAndrew) ; Land's End ; Harlyn B. 1 spec. (Thelwell) ; at Scilly single valves dredged in sand at 40 fm., r. and local (S. & C.)
 29. *Pteria hirundo*, Linn. Off the Eddystone ; taken from offing at Plymouth (M.B.A.) ; Falmouth (Hockin)
- PSEUDOLAMELLIBRANCHIA
30. *Pinna fragilis*, Pennant. From the *Zostera* zone down to 40 fm. ; dead shells n. unc. ; small specs. occ. on gravel in 20-30 fm. off Rame Hd. (M.B.A.) ; deep water off Polperro ! abund. 6 or 8 leagues S. of the Dodman (J. C.), off Gorran Haven ! small specs. c. in 15 fm. Falmouth B. ! a few among *Zostera* in harb. off the Lizard (R.Q.C.) ; Mount's B. ; Land's End ; Hayle, a few valves ; a few among the *Zostera* beds SW. of Tresco
 31. *Ostraea edulis*, Linn. Gen. dist. ; cultivated in the Tamar, Falmouth Harb. and the Helford river. At Scilly odd valves occ. Twenty or twenty-five years ago an attempt was made to introduce it there, but without success. var. *parasitica* Turton, c. about Polperro (J. C.) ; Gorran Haven ! Falmouth (V.) Helford ! var. *deformis* Lmk. Par (Marshall) and Hayle (Miss Hockin)
 32. *Pecten maximus*, Linn. Irregularly dist. round coast from *Zostera* beds down to at least 30 fm. ; gen. c. ; locally abund. Scilly
 33. *P. (Hinnites) pusio*, Linn. Gen. dist. round the coast, n. c. from l. w. to 40 fm. ; young specs. dredged on gravel off Menavawr, Scilly (S. & C.) ; a few adult valves in Porth Cressa B. !

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34. *Pecten (Chlamys) varius*, Linn. Gen. dist. and often c. from between t-m. to 40 fm.; Scilly in deep water off Menavawr (S. & C.); and among stones at Annett! var. *purpurea* Jeff. Falmouth (Tregelles), Truro river (James)
- [*P. (Chlamys) sulcatus*, Müll. 'M. Hanley showed me a single valve said to have been trawled near the Runnelstone (Wolf) lighthouse off the Land's End.' (Jeffrey, *Brit. Conchology*, v, 167)]
35. *P. (Aequipecten) opercularis*, Linn. Gen. dist. round coast between t-m. in Zostera beds and down to 40 fm.; in deepish water often in thickly populated beds; Scilly c. var. *lineata* da Costa, Fowey! Falmouth, Helford, Mount's B. and off Menavawr and St. Martin's, Scilly (S. & C., Jeffreys). var. *tumida* Jeffreys, Fowey!
- [A spec. of *Pecten clavatus*, var. *septemradiatus*, marked 'Falmouth' in M.R.I.]
36. *P. (Palliolum) tigrinus*, Müll. Apparently local, but n. unc. in 10 to 40 fm.; Rame-Eddystone and Eddystone Gnds. (M.B.A.); off the Dodman! Falmouth! 3 valves at Mullion! Mount's B.; Porthcurnow (Dennis); odd valves at Land's End (James); n. unc. Scilly on stony ground off Menavawr (S. & C.). var. *costata* Jeffreys, off the Dodman in 40 fm.! and outside Menavawr, Scilly (S. & C.)
37. *P. (Palliolum) incomparabilis*, Risso. Land's End and Nare Pt. (Hockin); one spec. in 15 fm. Falmouth B.!
38. *P. (Palliolum) striatus*, Müll. Plymouth (Jordan); Eddystone (M.); Wolf Rk. (Miss Carne); Scilly (Jeffreys)
39. *P. (Palliolum) similis*, Leskey. Evidently local; single valve Fowey Harb.! occ. spec. 20 fm. Falmouth B.! Mount's B. (McAndrew & Forbes); Wolf Rk., and outside Menavawr, Scilly, small and local (S. & C.)
40. *Lima subauriculata*, Mont. Whitsand B. (Jeff.), Fowey (M.), 40 fm. off the Dodman! Falmouth, Mount's B. (McAndrew & Forbes), Porthcurnow, Harlyn B. (Thelwell); a few valves off Menavawr, Scilly (S. & C.), alive in St. Mary's S. (M.)
41. *L. loscombi*, G. B. Sow. Rame-Eddystone Gnds. and n. unc. on the coarse grounds W. of the Eddystone (M.B.A.); Falmouth B. 25 fm.! in deep water Mount's B.; Porthcurnow, odd valves; Land's End; Wolf Rk. (Baily); live spec. r., single valves f. c. outside Menavawr, Scilly (S. & C.)
42. *L. hians*, Gmelin. Abund. l. s. t. in a stony patch N. of Plymouth breakwater (M.B.A.); St. Austell B., single valves only (Richards); few single valves 15 fm. Falmouth B.! Mount's B. (McAndrew & Forbes). var. *tenera* Turton, 40 fm. off the Dodman! 15 fm. Falmouth B.! Falmouth (Burkill); Land's End; few valves outside Menavawr, Scilly (S. & C.)
44. *Astarte sulcata*, da Costa. Apparently n. unc. in deepish water; often 15 to 30 fm. off Plymouth (M.B.A.); in trawl refuse Mevagissey! 20 fm. Falmouth B.! in trawl refuse Mount's B. (Tregelles); 2 living specs. and about 12 valves from deep water off Menavawr (S. & C.). Var. *paucicostata* Jeff., Mount's B. (Miss Tyacke)
45. *A. compressa*, Mont. Two live specs. from trawl refuse and 3 valves on Gyllyngvase beach (Cocks), and a single valve from Mount's B. (Miss Tyacke)
46. *Goodallia triangularis*, Mont. Evidently local at 30 fm. or more, rarely cast up on the coast; abund. off the Eddystone (M.); Whitsand B. (Jeff.), Falmouth (Mont.), Mount's B. (Tregelles), Land's End, Harlyn B. (Thelwell), Scilly (McAndrew)
47. *Isocardia humana*, Linn. Off Fowey (Peach); n. unc. in trawl refuse and dredgings from Falmouth B. and off the Manacles
48. *Cyprina islandica*, Linn. Apparently n. unc., 10 to 40 fm.; occ. dredged off Plymouth; Polperro! in 40 fm. off the Dodman! 20 fm. in Falmouth B.! from shallow water to 20 fm. Mount's B.; Mullion, Whitsand B., Hayle; young specs. Crow S., Scilly (S. & C.)
49. *Loripes lacteus*, Linn. N. unc. in trawl refuse and dredgings from Falmouth B.; few valves at Hayle, and on St. Martin's Flats (S. & C.); a live spec. obtained by C. Jeffreys at St. Mary's, Scilly
50. *Divaricella commutata*, Philippi. Obtained by Jeffreys at St. Mawes, by Montagu from Falmouth, by Turton from Land's End; valves occ. found at Hayle, and evidently c. and fresh in Crow S., Scilly (S. & C.)
51. *Lucina spinifera*, Mont. Dead shells n. unc. Plymouth district, but only one live spec. on Rame-Eddystone Gnds. (M.B.A.); n. unc. in trawl refuse and in 20 to 30 fm. dredgings from Falmouth B.; Mount's B.; St. Mary's S., Scilly (M.)
52. *L. borealis*, Linn. Dead shells along S., at times abund., and occ. at Hayle, Newquay! Harlyn B. (one young valve, Thelwell), and Bude! Live specs. irregularly from the Zostera bed down to 40 fm. Cawsand B. to Mount's B., and at Scilly
53. *Thyasira flexuosa*, Mont. Single valves often v. c. as at Cawsand B., Mount's B. (Tregelles), Scilly, and at Falmouth in March, 1904; Hayle (Hockin); live specs. abund. 15 fm. off Pennance! n. unc. occ. in trawl refuse at Mevagissey! Falmouth and Penzance; rr. Crow S., Scilly (S. & C.)
- [*T. ferruginosa*, Forbes. Is given in the Penzance list, but no authenticated Cornish spec. can be found]
54. *Montacuta substriata*, Mont. N. unc. on the anal spines of *Spatangus purpureus* around Plymouth, in Whitsand B., at Polperro, off the Dodman! Falmouth B. 15 to 25 fm.! Mount's B. and Scilly.

EULAMELLIBRANCHIA

43. *Turtonia minuta*, Feb. Few stray specs., chiefly single valves, Falmouth (Jeffreys), Mount's B., Land's End (M.R.I.) and Scilly (Penzance Mus.)

MARINE ZOOLOGY

55. *M. bidentata*, Mont. Occ. in 5 to 15 fm. on fine sand in Falmouth B. ! Mount's B., Porthcurnow, Land's End ; 4 valves in Harlyn B. (Thelwell), 2 valves at Bude ! c. in 8 fm., Crow S., Scilly (S. & C.)
56. *M. dawsoni*, Jeffreys. 'A single valve but unmistakable,' dredged in 40 fm. off Menavawr, Scilly (M.)
57. *M. donacina*, S. V. Wood. A single valve at Falmouth in 1839 (Jeffreys).
58. *Tellimya ferruginosa*, Mont. F. c. locally along S. coast in fine sand, from between t-m. to 30 fm., usually with *Echinocardium cordatum* ; Whitsand B., E. ; Polperro ! trawl refuse, Mevagissey. Porthscatho ! occ. dredged in 10 to 15 fm. in Falmouth B. ! Mount's B., Porthcurnow, Hayle (Miss Hockin), Harlyn B. (Thelwell), Padstow ! c. in 8 fm. Crow S., Scilly (S. & C.)
59. *Diplodonta rotundata*, Mont. Dead shells, often quite perfect, sparsely dist. round coast to Padstow, and on St. Martin's Flats, Scilly (S. & C.)
60. *Kellia suborbicularis*, Mont. F. c. on S. coast and in places abund., esp. on rocky shores, from l. w. to 40 fm. in crevices, attached to stones, in molluscan rock-borings and in fine silt inside dead shells ; Hayle, Harlyn B. (Thelwell), Widemouth B. near Bude ! Scilly in 40 fm. off Menavawr, and under stones on St. Martin's Flats but never c. (S. & C.). [var. *lactea* Brown marked by Hockin as Cornish but no spec. has been preserved.]
61. *Lasaea rubra*, Mont. C. between t-m. round coast, esp. in crevices on rocky shores ; abund. even at Newquay and Widemouth B. ! Harlyn B. (Thelwell) ; widely dist. Scilly. var. *pallida* Jeff., rocks under Cromwell's Castle, Scilly (S. & C.)
62. *Lepton squamosum*, Mont. Dead shells occ. between t-m. and in dredgings ; Plymouth, Fowey (Alder), Helford (Hockin), Mount's B. (Tregelles), and Scilly (Jenkinson)
63. *L. nitidum*, Turton. Falmouth (Rogers) and St. Mary's S., Scilly (M.). var. *convexa* Alder, Falmouth (Hockin), and St. Mary's S., Scilly (M.). var. *psidialis* Jeffreys in 40 fms. Scilly (M.)
64. *L. sykesii*, Chaster. Dr. Chaster found this in sand dredged by Tregelles in Mount's B. ; previously only from Guernsey.
65. *L. sulcatulum*, Jeffreys. Burkill and Marshall found a dozen perfect specs. and many valves at Muncoy Neck and off Menavawr, Scilly ; off Land's End (M.)
66. *L. clarkiae*, Clark. Fowey (Barlee), Falmouth (Hockin), Sennen and St. Ives (M.) ; a few valves off Menavawr, Scilly (M.)
67. *Galeomma turtoni*, J. de C. & G. B. Sow. Two single valves off Menavawr, Scilly, one by Smart, the other by Burkill
68. *Syndosmya prismatica*, Mont. Single valves f. c., occ. abund. around Falmouth, Mount's B., and Hayle ; live specs. at times in trawl refuse, Falmouth and Porthloe ! dredged from patch of muddy sand in 15 fm. off Pennance ! and in shallower water, Mount's B. ; c. at Scilly in 8 fm. in Crow S. and inside Round Is. (S. & C.)
69. *Syndosmya nitida*, Müll. Occurs with *prismatica* in all the above localities, though often scarce ; Cawsand B. (M.)
70. *S. alba*, Wood. Probably often overlooked ; identified in trawl refuse at Falmouth, though not found off Pennance ! valves found in Helford river, at Hayle, and Harlyn B. (Tellam) ; Mount's B. ; Scilly (Smart). var. *oblonga* Marshall, Scilly (M.)
71. *S. tenuis*, Mont. Dead valves, Mount's B. (Miss Tyacke), Hayle (Hockin)
72. *Scrobicularia plana*, da Costa. Usually found in silt and fine mud. Headquarters in creeks of Falmouth Harb. and Helford river ; c. in St. John's Lake, Hamoaze ; Looe, Par, Fowey, Mount's B., Hayle, mouth of the Camel, and at Porthellick, St. Mary's, Scilly (S. & C.)
73. *Ervilia castanea*, Mont. Valves occur in Whitsand B., St. Austell B., Gorran Haven ! scarce in Falmouth B., at Mullion, abund. locally Mount's B. and Land's End, Hayle ; and Bude (3 valves !) ; Scilly, off Menavawr and Muncoy and in St. Mary's S., the two first-named places having each yielded one perfect adult example (M.). var. *subtrigona* Marshall, Land's End and Scilly (M.)
74. *Gastrana fragilis*, Linn. Found at Falmouth by Miss E. Carne
75. *Tellina balaustina*, Linn. A single valve from trawl refuse Falmouth, Aug. 1845, and a perfect shell from same boat, 1848 (Cocks). A fine valve in fresh condition from St. Mary's S., Scilly (M.)
76. *T. crassa*, Gmelin. Evidently gen. dist. from Plymouth to Padstow ; single valves Bude and Marsland Mouth ! often between t-m. after storms, c. in trawl refuse ; dredged down to 40 fm. off the Dodman ; n. unc. at Scilly. var. *albida* Jeffreys, equally c. with the type, Porthpean, St. Austell (Richards) ; often dredged with the type in 10 to 25 fm., Falmouth B. ! with the type near Pentle B., Scilly (S. & C.)
77. *T. squalida*, Pulteney. Dead shells found from Plymouth to Hayle, but usually scarce on beaches, though at times c. in trawl refuse ; live specs. St. Austell B. (Richards) ; Gorran Haven ! c. off Helford river ; at Scilly, alive on St. Martin's Flats, valves c. Crow S. (S. & C.)
78. *T. donacina*, Linn. Sparingly dist. in sandy bays along S. coast, often between t-m. or at l. s. t. ; Whitsand B. (Robinson), near Looe (Waters), Pendower beach, Gyllyngvase beach, Mount's B., Porthcurnow (Dennis) ; occ. in trawl refuse ; Scilly, n. c.
79. *T. pusilla*, Philippi. Dist. and habitats similar to those of *T. donacina*, more c. ; not recorded E. of Fowey ; Harlyn B. (Thelwell) and stray valves at Bude ! Pentle B. and St. Martin's Flats (S. & C.)

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80. *Tellina serrata*, Renier. Two valves found by Marshall in dredgings from 40 fm. off Menavawr, Scilly
81. *T. tenuis*, da Costa. Dead shells often met with from Par westwards; sometimes v. c. Falmouth, Helford, locally in Mount's B., at Porthcurnow and Hayle; St. Austell B., Crinnis and Pentewan beaches (Richards); occ. dredged in Falmouth B.; 2 or 3 examples cast up on sandy beaches Scilly (S. & C.)
82. *T. fabula*, Gronovius. N. unc. along the S. coast, chiefly in *Zostera* beds, but occ. in sand at l. w.; Cawsand B. (M.B.A.), Falmouth Harb.; Gyllyngvase beach, Helford, Mount's B. Dead shells at times f. c. at Hayle; Padstow! 2 or 3 perfect specs. Crow S., Scilly (S. & C.)
83. *Macoma balthica*, Linn. Usually found in estuarine sand at l. w. One spec. from Saltash is the only record for the Plymouth district; n. unc. Fowey; abund. Par (Richards); Falmouth B. r., though dead shells at times abund., esp. in Harb.; local in Mount's B.; Hayle; not found at Scilly. var. *minor* Jeffreys, Helford (Rogers); var. *nivea* Jeffreys, Land's End (Hockin)
84. *Donax vittatus*, da Costa. Dead shells often with perfect valves irregularly from Whitsand B. to Mount's B., and from Hayle to Padstow; live specs. in sand at l. w. at Whitsand B., Fowey! Pendower and Gyllyngvase! and 2 in Padstow B.! Not known at Scilly. var. *nitida* Jeffreys found at Hayle by Miss Hockin
85. *D. variegatus*, Gmelin. Single valves only on S. sandy beaches from Plymouth to Porthcurnow; Hayle and thrice at Padstow! have never seen a live spec. from Cornwall; Scilly (Jenkinson)
86. *Macra stultorum*, Linn. Single valves c. from Whitsand B., E. to Padstow, and occ. at Bude! live specs. found occ. in trawl refuse along S. coast; Scilly (Jenkinson). var. *cinerea* Mont. Falmouth (Cocks); Hayle (Miss Hockin)
87. *M. glauca*, Borm. Single valves occ. Hayle, one at Padstow! and several fragments at Land's End (Lindsay). var. *luteola* Jeffreys, at Hayle (Jeff.)
88. *Spisula solida*, Linn. C. in sandy bays round coast and at Scilly. var. *intermedia* Jeffreys, at Scilly (Smart). var. *truncata* Mont. often with type, esp. c. in Pentle B., Scilly (S. & C.)
89. *S. elliptica*, Brown. Irregularly dist. but gen. c. from Plymouth S. to Land's End on the shallow trawling gnds.; dead valves often found between t-m.; not recorded for N. coast; Scilly
90. *S. subtruncata*, da Costa. Sandy bays from Par to the mouth of the Camel; occ. in trawl refuse; Scilly. var. *striata* Brown, at Helford (Rogers)
91. *Lutraria elliptica*, Lmk. At l. w-m. in sandy bays and in the *Zostera* beds round coast from Plymouth S. to Padstow; valves occ. at Bude! c. and of large size at Scilly (S. & C.)
92. *L. oblonga*, Chemnitz. Live specs. n. unc. at Par and Helford; fresh valves, Falmouth and St. Minver (Tellam); Scilly (Jenkinson)
93. *Lucinopsis undata*, Pennant. Live specs. c. near the mouth of the Helford and taken in Mount's B.; single valves occ. Plymouth S., Whitsand B., Falmouth, Hayle, and Padstow! Type does not occur at Scilly. var. *aequalis* Jeffreys. First recorded from Scilly by Lord Vernon; found by Smart sparingly on St. Martin's Flats
94. *Dosinia exoleta*, Linn. C. round coast and at Scilly, in sandy bays, and on sand or fine gravel down to 40 fm.; abund., Scilly
95. *D. lupina*, Linn. As widely dist. but not so c. as *D. exoleta*; scarcer in E. than in W., and more c. in deep water than in shallow; on N. coast chiefly represented by dead shells; St. Mary's Flats and Pentle B., Scilly, but seldom found alive (S. & C.)
96. *Meretrix chione*, Linn. Dead shells round coast from Plymouth S. to Padstow; live specs. occ. on the sand at l. s. t. at St. Austell B. (Richards), and at Gyllyngvase beach; c. in two patches in Falmouth B. in 15 fm.! dredged in Mount's B.; n. unc. in clean sand, Scilly; often large and beautiful on St. Martin's Flats and Pentle B. at l. s. t. (S. & C.)
97. *Venus (Clausinella) fasciata*, da Costa. C. round coast and at Scilly in sand and gravel from l. w. m. to 40 fm. off the Dodman! and off Menavawr (S. & C.); c. also on Coralline ground. var. *radiata* Jeffreys. With the same range in depth occurs at Polperro! Falmouth B.; Porthcurnow; Hayle; Scilly littoral and at 40 fm. (S. & C.)
98. *V. (Ventricola) casina*, Linn. Locally from l. w. to 60 fm. (Peach, off the Dodman); occ. on gravel gnds., 10-30 fm., outside Plymouth S. (M.B.A.); Falmouth B. at l. s. t. and at 20 fm.! Mullion; Mount's B.; Porthgwarra (Dennis); Hayle; Wolf Rk (Hockin); c. Pentle B. at l. w-m. on St. Martin's Flats and between Bryher and Tresco (S. & C.)
99. *V. (V.) verrucosa*, Linn. Gen. dist. on sand and gravel along S. coast; occ. at l. s. t., as on Pendower beach and at Helford, gen. at 10 to 30 fm., but off the Dodman in 40 fm. and over; odd valves at Hayle and Newquay! Scilly, n. c. (S. & C.)
100. *V. (Timoclea) ovata*, Pennant. F. c. along S. coast on coralline ground, in trawl refuse, in 10 to 60 fm. dredgings, esp. on gravel; often attached to the byssus of Pinna (Couch); valves at Hayle, Perranporth! and Padstow! Scilly, c. from deep-water dredgings.
101. *V. (Chamelaea) gallina*, Linn. In sand and fine gravel from between t m. to 40 fm.; f. c., Cawsand B. and occ. on the outer gnds. round Plymouth S. (M.B.A.); Polperro, at l. w.; Porthpean beach, St. Austell (Richards); trawl refuse Mevagissey, Falmouth B. in 20 fm.! dead shells at Hayle; live specs. at Perranporth and Newquay at l. s. t.! Scilly, n. c., from Crow S. and along the shore (S. & C.)
102. *Tapes aureus*, Gmelin. Only dead shells found around Plymouth (M.B.A.), but live specs. at Par, from Pendower to Hayle c., and at Helford and the bar at Falmouth, abund; also occ.

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- sands at Padstow and at Scilly locally abund. var. *ovata* Jeffreys, obtained by Jeffreys at Falmouth. var. *quadrata* Jeffreys, found at Falmouth (Hockin), and at Hayle (Miss Hockin)
103. *T. virgineus*, Linn. C. on sand and gravel from Plymouth S. to Padstow, sometimes between t-m. as at Porthpean, St. Austell (Richards), and at Helford; often from 10 to 40 fm. in trawl refuse and dredgings; at Scilly f. c. on St. Martin's Flats and on the sandy shores of Tresco. var. *sarniensis* Turton, at St. Austell and Falmouth (J. C.); c. at Helford (Richards); Scilly, r. (S. & C.)
104. *T. pullastra*, Mont. In sand and fine gravel from between t-m. to 15 or 20 fm.; occ. Plymouth S., Whitsand B., Par; Porthpean beach (Richards); in trawl refuse, Mevagissey! Falmouth B.; and abund. at Helford, Mount's B., St. Minver; at Scilly, esp. Tresco to Bryher (S. & C.). var. *perforans* Mont., about Plymouth (M.B.A.); Par (Tellam); Falmouth and Penzance (Burkill) and Helford (Hockin)
105. *T. decussata*, Linn. N. unc. on most sandy or gravelly beaches and in dredge refuse along S. coast; abund. Helford; r. Newquay and St. Minver (Tellam); the scarcest of the *Tapes* at Scilly, found in numbers only at one spot on Tean (S. & C.)
106. *Gouldia minima*, Mont. N. unc. trawl refuse and in dredgings on sand and gravel from 5 to 40 fm. along S. coast; occ. on Queen's Gnd. and on Eddystone Gnds. (M.B.A.); Falmouth and Mount's B.; Wolf Rk. (Hockin); single valves at Porthcurnow; Hayle; 2 at Padstow! At Scilly in 40 fm. off Menavawr (S. & C.). var. *triangularis* Mont. occ. Falmouth
107. *Irus irus*, Linn. Falmouth (Cocks); Mousehole (Baily); Porthcurnow; Land's End (E. D. Marquand); Hayle and Harlyn B.; Scilly, r. (M.)
108. *Cardium aculeatum*, Linn. Trawl refuse r.; dead shells cast up at long intervals, Pentuan (J. C.); Falmouth; Helford; Mount's B. and Hayle; dead shells in almost perfect condition dredged off Helford river, fragments n. unc. in other parts of Falmouth B.!
109. *C. echinatum*, Linn. Live specs. n. c. in 8 to 30 fm. on sand and gravel and gen. immature; dead shells dist. irregularly Plymouth S. to Hayle and in fresh condition are characteristic of the 'Inner' and 'Outer' trawling gnds. at the Eddystone (M.B.A.); live specs. at Falmouth (V.); off Helford in 15 fm.! Mount's B. and in Crow S., Scilly (S. & C.). var. *expansa* Jeffreys, in Plymouth S. (M.)
110. *C. tuberculatum*, Linn. Single valves round coast, Looe to Bude! and occ. fresh dead shells in beautiful condition in trawl refuse and in dredgings from about 20 fm. in Falmouth B.; have never seen a live Cornish spec.
111. *C. papillosum*, Poli. Two fresh valves Falmouth Harb. in 19 fm. (M.); Helford (Rogers), Mount's B., dredged (Tregelles), St. Ives (Dodd), and a fresh valve in 40 fm. Scilly (M.)
112. *Cardium exiguum*, Gmelin. On sand and gravel from l. w. to at least 15 fm., locally c. round coast; Polperro! Par sands, Falmouth B., in Mount's B.; r. Hayle, Perranporth! Newquay! and young specs. Harlyn B. (Thelwell)
113. *C. fasciatum*, Mont. C. in 40 fm. off the Dodman! n. unc. in trawl refuse and dredgings, Falmouth B., though gen. small! Mount's B.; Porthcurnow, dead shells n. unc.; Whitsand B., Land's End! Hayle, and in deep water off Menavawr, Scilly (S. & C.). var. *alba* Jeffreys, at Scilly (M.)
114. *C. nodosum*, Turton. Dead shells n. unc. from Fowey westwards, live specs. apparently only in deep water; in 40 fm. off the Dodman! in Falmouth B. 20 fm., chiefly dead shells, but live specs. occ.! Mount's B. (Tregelles), Wolf Rk. (Miss Carne); c. in deep water off Menavawr and occ. alive (S. & C.). var. *rosea* Lmk., at Falmouth (Hockin)
115. *C. edule*, Linn. Abund. in sandy bays and flats to Padstow, though only an odd valve has been found at Newquay; Truro and Helford river, c.; found at Bude! Scilly, v.c. var. *rustica* Jeffreys, at Falmouth (James). var. *crenulata* Lmk., Mount's B. (Miss Hockin); Hayle (M.R.I.); a form approaching this var. occurs abund. near Pentle B. (S. & C.)
116. *C. minimum*, Phil. Two small valves from Muncoy neck, Scilly (Marshall); the first occurrence on the English coast 50 m. NW. of Land's End in 50 fm. (McAndrew)
117. *C. (Laevicardium) norvegicum*, Speng. N. unc. and f. gen. dist. on gravel and coarse sand from l. t-m. to 40 fm. along S. coast; dead shells often c., and occ. at Hayle; n. unc. alive in Pentle B. and on St. Martin's Flats (S. & C.). var. *gibba* Jeffreys, Hayle (Miss Tyacke). var. *rotunda* Jeffreys, Helford (H.). var. *pallida* Jeffreys, Helford (Rogers), Mount's B. (Tregelles), Hayle (Miss Hockin)
118. *Gari tellinella*, Lmk. In variable numbers in sandy gravel round coast to Padstow, and also on gravels and coarse sands in deep water, e.g. on the Rame-Eddystone Gnds. in 30 fm. (M.B.A.), off the Dodman in 40 fm. Falmouth B. in 8 to 20 fm. c. l. t-m. and deep water, Scilly
119. *G. costulata*, Turton. Gen. with *G. tellinella* on mainland, and at Scilly but less c.; on the N. coast only from Hayle
120. *G. ferroensis*, Chemnitz. Dead shells dist. all round coast to Padstow, and in places down to 40 or 50 fm.; live specs. n. unc. from l. w. downwards, and at times plentiful on the beaches after stormy weather; f. c. St. Martin's Flats, Scilly (S. & C.)
121. *G. (Psammocola) depressa*, Pennant. Sparingly dist. on sand and fine gravel between t-m., but odd valves more in evidence than live specs.; Polperro! Fowey! Falmouth B.; Mount's B. (Marquand), Land's End (M.R.I.) and Hayle, and a few valves at Padstow! Scilly, but never abund. (S. & C.)

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122. *Mya truncata*, Linn. Valves c. at Falmouth and in the Truro river, but live specs. somewhat scarce; Mount's B. (Tregelles) and Scilly (Jenkinson)
123. *Sphenia binghami*, Turton. Falmouth (Hockin), Helford (M.R.I.), Land's End (M.), Harlyn B., 1 valve (Thelwell)
124. *Corbula gibba*, Olivi. In colonies in muddy sand and gravel from shallow water down to 30 fm.; Rame-Eddystone Gnds. (M.B.A.), Polperro (Robinson), Fowey! Gorran! Falmouth B. 10 to 15 fm. ! Mount's B. (Tregelles); Crow S., Scilly, and elsewhere (S. & C.). var. *rosea* Brown, off Nare Pt., Helford (Hockin); Falmouth (M.R.I.)
125. *Solecurtus scopula*, Turton. One spec. Eddystone Gnds. (M.B.A.); 4 off Polperro in 10 fm. (Robinson); Falmouth (Hanley); dead shells occ. dredged Falmouth B. ! Penzance (McAndrew & Forbes), Hayle (Hockin); not unc. l. w-m. Pentle B., Scilly (S. & C.). var. *oblonga* Jeffreys, Porthcurnow (Miss Lavars)
126. *S. antiquatus*, Pulteney. A single live spec. off Rame Hd., though dead shells n. unc. (M.B.A.); several live specs. and many dead shells off Polperro (Robinson), Looe (Mont.), Gorran Haven (Peach), Falmouth (Jeffreys); dead shells at times, Falmouth B. in 20 fm. ! Mount's B. (Tregelles)
- [*Pharus legumen*, Linn. Occurs on the list at Tresco and was reported in trawl refuse by Cocks, but there is no Cornish specimen in any collection]
127. *Cultellus pellucidus*, Pennant. Cawsand B. c. (M.B.A.), occ. Polperro ! locally c. 10 to 15 fm. Falmouth B. ! abund. Mount's B.; Hayle (Hockin); Scilly in 8 fm., Crow S., and inside Round Is. (S. & C.).
128. *Ensis ensis*, Linn. N. unc. locally along the S. coast about l. w-m. on sandy beaches and on sandy patches; Cawsand B. (M.B.A.), Polperro (Robinson), Falmouth B., Coverack (James), Mount's B., and Padstow (Tellam)
129. *E. siliqua*, Linn. Gen. dist. in sand at l. w-m. from Looe to Camel Est. and at Scilly; dead shells Plymouth S. and N. coast at Bude ! var. *arcuata* Jeffreys, occ. Pentuan beach (Richards); Coverack (James)
130. *Solen vagina*, Linn. Drake's Is. in 20 fm. off Polperro (Robinson), l. w-m. Fowey (M.R.I.), in 30 fm. Falmouth (Hockin), shallow water to 10 fm., Helford ! Mount's B., Hayle (Dennis)
131. *Saxicava rugosa*, Linn. On ledges and rocky beaches between t-m. to 40 fm. at least; evidently gen. dist. and locally c. on S. coast and at Scilly; Perranporth and Widemouth B. ! young specs. Harlyn B. (Thelwell)
132. *S. arctica*, Linn. Evidently c. at 20 to 40 fm. on shells and the roots of Hydroids and in sand-cracks; Rame-Eddystone and Eddystone Gnds. (M.B.A.); in 30 fm. off Polperro (Robinson), in 40 fm. off the Dodman ! occ. Porth-
- pean, St. Austell (Richards); in 20 fm. Falmouth B.; Mount's B.; off Land's End, odd valves; valves also found at Hayle; in 40 fm. at Scilly. var. *praecisa* Mont. c. on rocks at l. w. attached to the roots of coralline by a byssus (J.C.). var. *cylindrica* S. V. Wood, Land's End (M.)
133. *Gastrochaena dubia*, Penn. Plymouth breakwater and Asia shoal (M.B.A.). One spec. boring in an oyster shell, in 40 fm. off the Dodman ! 2 valves dredged in 20 fm. Falmouth B. ! Penzance (S. & C.) from l. w. to 20 fm. (M.)
134. *Pholas dactylus*, Linn. Attacks shale, friable slate and sandstone, but apparently has not been found in granite; near Fowey (J.C.), the Dodman ! Falmouth, in rocks on the littoral, at the Manacles ! Marazion (Millet), Penzance (E. D. Marquand), Hayle (Miss Hockin)
135. *Barnea candida*, Pennant. In very friable shales and in sandstone; Pridmouth (Tellam); Falmouth, scarce; Helford, abund. in a low ridge of rotten shale ! Mount's B. (Miss Tyacke)
136. *B. parva*, Pennant. Pridmouth (J.C.); dead shells in sandstone at Gyllyngvase; a colony in the seaward end of the ridge containing *B. candida* at Helford ! Penzance (E. D. Marquand)
137. *Zirphaea crispata*, Linn. Dead shells occ. Falmouth; Hayle (Hockin)
138. *Pholadidea loscombiana*, Goodall. V.c. in reddish sandstone in deep water (J.C.); n. unc. Falmouth in soft slate and sandstone; a mass of sandstone dredged in 10 fm. off Helford contained 2 live specs. and several dead shells ! Hayle (Miss Hockin); 4 dead shells in soft slate on Millook beach (Miss E. A. Reynolds)

None of the last six species occurs at Scilly

139. *Xylophaga dorsalis*, Turton. Plymouth S. (M.); a single valve in 40 fm. off the Dodman ! Falmouth (Miss Vigurs); the Lizard (Miss Carne); a single valve off Menavavr (S. & C.), and dredged in St. Mary's S. (M.)
140. *Teredo norvegica*, Speng. In driftwood, Fowey ! in timber of Falmouth breakwater; driftwood at Maenporth (Tregelles); in jetty, Penzance; Land's End (Hockin); Hayle (Miss Hockin)
141. *T. navalis*, Linn. N. unc. in drift and submerged wood, breeding in July (M.B.A.); much of the woodwork at Pentuan riddled by this mollusc (Richards); in most submerged timber at Falmouth; Newquay (V.)
142. *T. megotara*, Hanley. Occ. in ship's timber at Falmouth; washed up in driftwood at Gorran Haven (J.C.) and Gurnard's Hd. (Dennis); docks, Hayle. var. *mionata* Jeffreys, in cork washed ashore (Jeff.)
143. *T. malleolus*, Turton. Falmouth (Norman), in cork floats from deep water (Cocks); in driftwood at Gurnard's Hd. (Dennis)
144. *T. bipinnata*, Turton. In oak timber from deep water at Falmouth (Cocks); live specs. washed ashore in timber at Hayle (Hockin)

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[*Teredo fimbriata*, Jeffreys. In the keel of a Dutch barque at Falmouth (Howard Fox)]

GASTROPODA

ASPIDOBRANCHIA

145. *Pandora inaequivallis*, Linn. Apparently n. unc. 15 to 40 fm. along the S. coast, often in trawl refuse; occ. Cawsand B. on the Rame-Eddystone and Eddystone Gnds. (M.B.A.); in 30 fm. off Polperro (Robinson), in 40 off the Dodman! Falmouth B. 15 fm. ! Mount's B. 20 fm. (Tregelles), about Wolf Rk. (Miss Carne), one spec. 40 fm. off Menavawr and one off Round Is. Scilly (S. & C.)
146. *Lyonsia norvegica*, Chemnitz. Occ. Cawsand B. (M.B.A.); in 12 fm., Falmouth B. ! Mount's B. (McAndrew and Forbes); in St. Mary's S., Scilly (M.)
147. *Cochlodesma praetenuis*, Pulteney. In sand at l. s. t-m., but somewhat scarce; Looe (Harris), Falmouth, Maenporth, once at Helford! Mount's B. (McAndrew and Forbes); rr. St. Martin's Flats (S. & C.). Dead shells more c. and widely dist. Plymouth district, Porthcurnow, and at Hayle
148. *Tbracia fragilis*, Pennant. In sand at l. w., evidently scarce; Helford (Dennis) Mount's B., Porthcurnow (E. D. Marquand), Hayle, 1 young valve at Harlyn B. (Thelwell); abund. in sandy bays at Scilly. var. *villosiuscula* Macgillivray; same dist. as type except Harlyn B.; Wolf Rk. (Miss Carne)
149. *T. pubescens*, Pulteney. Occ. in trawl refuse at Falmouth; dead shells only in Plymouth district
150. *T. convexa*, W. Wood. Gorran Haven (Peach), Falmouth, Helford (Rogers); Mount's B. (Miss Tyacke), Hayle (Hockin)
151. *T. distorta*, Mont. N. unc. in stones from deep water (J. C.); in 30 fm. off Polperro (Robinson); near Fowey (M.), 2 spec. from 15 fm. Falmouth B. ! Mount's B. (Miss Carne), Land's End (Rogers); 1 young valve, Harlyn B. (Thelwell); 4 or 5 single valves at Scilly (S. & C.). var. *truncata* Turton, at Falmouth (Jeff.)
155. *Patella vulgata*, Linn. Gen. dist. and abund. on rocks between t-m. round coast and at Scilly. var. *elevata* Jeffreys, Helford (Rogers), and Perranporth (James). var. *picta* Jeffreys, Porthpean, St. Austell (Richards); Helford (Rogers). var. *intermedia* Knapp, Porthpean (Richards); Helford (Rogers). var. *coerulea* Linn. Trenarren, near St. Austell (Richards)
156. *Patella depressa*, Pennant. Same habitat and dist. as *P. vulgata*
157. *Helcion pellucida*, Linn. C. everywhere attached to the stems and fronds of Laminaria. var. *laevis* Pennant, c. on Laminaria round coast to Padstow, esp. after a storm; occ. Bude! on a few beaches chiefly represented by dead shells
158. *Acmaea virginea*, Müll. F. c. in colonies under stones on rocky shores along S. coast from l. w-m. to about 10 fm.; on N. coast only occ. reported E. of Padstow; Crow S. (S. & C.), and on Annett at l. s. t. ! var. *cornica* Jeffreys, Helford (Rogers), Scilly (M.). var. *lactea* Jeffreys, Gorran Haven (J. C.), Helford (Rogers)
159. *Emarginula fissura*, Linn. From between t-m. down to 40 fm.; always present but seldom numerous on the Eddystone Gnds. (M. B. A.); 30 fm. off Polperro (Robinson); 40 fm. off the Dodman! local in Falmouth B. from between t-m. down to 25 fm. ! Mount's B. to Land's End; Harlyn B. (Thelwell); dead shells off Menavawr (S. & C.). var. *subdepressa* Jeffreys, Scilly (M.). var. *elata* Jeffreys, Land's End (Hockin). var. *incurva* Jeffreys, Land's End (Hockin)
160. *E. conica*, Schumacher. N. unc., Plymouth, in 30 fm. off Polperro (Robinson), at Fowey (Peach), in 18 fm. Falmouth B. ! Mount's B.; scarce off Menavawr (S. & C.)
161. *Fissurella graeca*, Linn. Irregularly dist. and locally c. on rocky shores on S. coast from between t-m. to 20 fm.; Harlyn B.; dead shells off Menavawr (S. & C.)
162. *Gibbula magus*, Linn. Gen. dist. round coast and at Scilly on coarse shell sand and gravel from between t-m. down to 10 or 12 fm.; abund. Helford and Mount's B.; n.c. Plymouth S., St. Austell B., Falmouth, and long stretches on N. coast; Scilly, c. var. *alba* Jeffreys, Scilly
163. *G. tumida*, Mont. N. unc. in trawl refuse and in dredgings from 20 to 40 fm.; occ. specs. Rame-Eddystone, Eddystone, and other outer gnds. Plymouth (M. B. A.); in 25 fm. Whitsand B. (Robinson); in 20 fm. Falmouth B. ! Mount's B.; Porthgwarra (Dennis); Land's End; Harlyn B. (Thelwell); off Menavawr (S. & C.)
164. *G. cineraria*, Linn. Gen. dist. and usually abund. all round coast and at Scilly, under stones. Zostera, Fucus, &c., from between t-m. to 15 fm. var. *electissima* Bean, Helford (Rogers). var. *variegata* Jeffreys, Mevagissey (Dunn), Helford (Rogers)

SEPTIBRANCHIA

152. *Cuspidaria cuspidata*, Olivi. Land's End (McAndrew and Forbes)

SCAPHOPODA

153. *Dentalium entalis*. On fine sands and occ. on gravel; n. unc. on Eddystone Gnds. (M.B.A.); in 25 fm. off Polperro (Robinson); in 15 fm. in St. Austell B. (M. Dunn); abund. on a sandy patch about 1½ m. SW. of Falmouth Lighthouse, elsewhere r. (V.); Mount's B.; Hayle, St. Ives (V.), a few dead shells at Padstow! 3 or 4 spec. Crow S. (S. & C.)
154. *D. vulgare*, da Costa. Attached to the byssus of Pinna, r. (J. C.). Falmouth (Mont.); Mount's B. (Tregelles); Porthcurnow (Dennis)

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165. *Gibbula umbilicata*, Mont. Gen. dist. and usually c. round coast and at Scilly, chiefly from h. w.-m. to l. s. t.-m. var. *atro-purpurea* Jeffreys, Falmouth, Hayle, and Mawgan Porth (Miss Hockin)
166. *Monodonta crassa*, Montford. C. on restricted areas on rocky beaches all round coast and at Scilly chiefly from above h. w. m. to half t.-m.
167. *Calliostoma montagui*, W. Wood. Scarce in trawl refuse and in dredgings from deep water; in 25 fm. Falmouth B. ! Mount's B.; in 40 fm. off Menavawr, Scilly (S. & C.)
168. *C. striatum*, Linn. Chiefly on *Zostera* beds, where it is often abund.; Cawsand B. (M.B.A.), Falmouth, v. c.; Helford; Mount's B.; Land's End (McAndrew); Padstow ! Scilly, abund.
169. *C. exasperatum*, Pennant. Dead shells occ. found, live specs. r.; Falmouth, Helford, Mount's B., Land's End
170. *C. miliare*, Brocchi. In 30 fm. Falmouth (Hockin); Porthgwarra, in trawl refuse (Dennis); Wolf Rk. (Miss Carne); at Scilly one spec. in 40 fm. off Menavawr (S. & C.)
171. *C. granulatatum*, Born. N. unc. on sandy and on fine gravel in deep water; Eddystone Gnds. (M. B. A.); Whitsand B. (Jeff.); in 35 fm. off Polperro (Robinson); trawl refuse at Mevagissey ! in 20 to 25 fm. Falmouth B. ! Mount's B., Land's End (Maton); dead shells in Widemouth B. (Miss E. A. Reynolds); a few dead and imperfect specs. off Menavawr (S. & C.), and live specs. from St. Mary's S. (M.). var. *lactea* Jeffreys, Mount's B. and St. Mary's S., Scilly (M.)
172. *C. zizyphinus*, Linn. C. under stones and in rocky crevices at l. w. along S. coast and locally on N.; also in trawl refuse, and in 25 fm. in Falmouth B. ! Scilly everywhere at l. w. but n. c. var. *Lyonsi* Leach, near Fowey (M.); Helford (Hockin); Mount's B. alive from trawl (Tregelles); Porthgwarra (Marquand); under stones and overhanging rocks on the Golden Ball bar, and in deep water off Menavawr (S. & C.). var. *humilior* Jeffreys, Scilly (M.). var. *laevigata* J. Sow, Helford (Hockin), trawl refuse Mount's B. (Tregelles). var. *granulifera* Jeffreys, Mount's B. (Tregelles). var. *elata* Jeffreys, one spec. Falmouth (James)
173. *Delphinoidea cutleriana*, Clark. Fowey (Barlee), Falmouth in 30 fm. ! Helford (Hockin), and Sennen; dredged off Menavawr and Muncoy Neck, Scilly (M.)
174. *D. nitens*, Philippi. Fowey (M.); in 40 fm. off the Dodman ! in 30 fm. Falmouth B. ! Sennen; off Menavawr and Muncoy neck (M.)
175. *D. serpuloides*, Mont. In 30 fm., Falmouth B. ! Mount's B.; 5 specs. at Harlyn B. (Thelwell); dead shells off Menavawr and Muncoy, but live specs. at l. w. and in Crow S. Chan. (M.)
176. *Phasianella pullus*, Linn. Gen. dist. and locally c. on *Zostera* and algae from l. w. down to 10 fm.; Scilly abund. in the roads. var. *pulchella* Rich., Scilly (M.)
177. *Lacuna crassior*, Mont. Porthcurnow (Dennis); Hayle (Hockin); 2 dead specs. in deep water, Scilly (S. & C.)
178. *L. divaricata*, Fab. On *Zostera* and fucus-covered rocks from l. w. to l. s. t.; c. at intervals along S. coast; one spec. Harlyn B. (Thelwell). var. *quadrifasciata* Mont. in shell sand irregularly along S. coast
179. *L. parva*, da Costa. Occ. on sea-weed between l. w. and l. s. t.-m.; Cawsand B. (M. B. A.); near Polperro ! Porthcurnow (Dennis), Land's End (Hockin); dead shells, Hayle; 3 specs. Harlyn B. (Thelwell); St. Mary's, Scilly. var. *conica* Jeffreys, and var. *expansa* Jeffreys, Mount's B. (M.). var. *lactea* Jeffreys, Hayle (Miss Hockin)
180. *L. pallidula*, da Costa. Gen. dist. and locally c. round the coast, gen. on fucus-covered rocks at l. w. also at 30 fm. in Falmouth B. ! at Scilly 1 spec. from the inner channel, 2 from deep water (S. & C.). var. *patula* Thorpe, Lantivet B. (Laughrin), Falmouth (M.). var. *albescens* Jeffreys, Mount's B. (M.)
181. *Littorina obtusata*, Linn. Abund. everywhere on Fucus and *Zostera*. var. *neritiformis* Brown, Land's End ! var. *ornata* Jeffreys, Falmouth (James), Helford (M. R. I.). var. *fabalis* Turton, Falmouth, and Maenporth (Dennis)
182. *L. neritoides*, Linn. Locally c. round coast on rocks at h. w. m. and above; Scilly on the outer rocks only
183. *L. rudis*, Maton. Abund. on almost every rocky shore on the mainland and at Scilly about h. w.-m. var. *saxatilis* Johnst. Helford and Mount's B. (Miss Tyacke). var. *sulcata* Leach, Land's End (Turton), Scilly (Barlee). var. *jugosa* Mont. Falmouth (M.), Helford (M. R. I.), Prussia Cove (Miss Tyacke), Penzance, r. (James). var. *patula* Thorpe, Lizard, Mount's B., Gurnard's Hd. (Miss E. Carne), Portreath, St. Agnes. var. *globosa* Jeffreys, Hayle (Miss Hockin). var. *tenebrosa* Mont. Hayle, Portreath, St. Agnes; Newquay c. var. *similis* Jeffreys, Kynance Cove (Miss Tyacke)
184. *L. littorea*, Linn. N. unc. between t.-m. on mainland and often most abund.; at Scilly only 2 specs. found on the E. coast of Bryher (S. & C.). var. *brevicula* Jeffreys, Maenporth (Miss Dixon); also in M. R. I.
185. *Rissoa parva*, da Costa. Gen. dist. round coast and at Scilly from between t.-m. to 40 fm. var. *interrupta* Adams, littoral and shallow water form; irregularly round coast, Scilly c. var. *exilis* Jeffreys, Falmouth and Scilly (M.)
186. *R. inconspicua*, Alder. Porthpean nr. St. Austell under stones, rr. (Richards); in 25 fm. Falmouth B. ! Mount's B. chiefly dead shells; Porthcurnow apparently all dead shells; Land's End; occ. off Muncoy Neck, Scilly (M.)
187. *R. albella*, Loven. Type has not been found, but James obtained 3 specs. of the var. *sarsii* Loven, at Land's End.

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188. *Rissoa violacea*, Desmarest. Falmouth (M.); Helford (M. R. I.); Mount's B. (Dennis)
189. *R. guerini*, Recluz. Helford and Mount's B.; Land's End c. (James). var. *costulata* Alder, Land's End (Mrs. Paull)
190. *Alvania lactea*, Michaud. Three dead specs. near Fowey (M.); Helford (M. R. I.)
191. *A. cancellata*, da Costa. Dead shells n. unc. round coast, but live specs. occur chiefly in the deeper dredgings in 30 fm. off Polperro (Robinson), in 25 fm. Falmouth B., and in 40 fm. at Scilly; Mount's B. (Tregelles), Porthcurnow and Porthgwarra (Dennis), Wolf Rk. (Miss E. Carne)
192. *A. reticulata*, Mont. Dead shells occ. round coast from Plymouth S. to Harlyn B.; live specs. chiefly from deep water off Looe, Falmouth, and Scilly. var. *calathus* F. & H. similar in occurrence and dist. to the type. var. *cimicoides* Forbes, with the type round mainland and at Scilly
193. *A. Jeffreysi*, Waller. Several dozen specs. at Scilly to E. of St. Mary's, off Menavawr and Muncoy, in 30 to 40 fm. (M.)
194. *A. punctura*, Mont. Mount's B.; Sennen (M.); Land's End; Harlyn B. (Thelwell); Scilly, abund. in deep water (S. & C.). var. *diversa* Jeffreys, in 40 fm. Scilly (M.); Land's End (M.)
195. *A. subsoluta*, Aradas. In 40 fm. at Scilly (M.)
196. *Manzonina zetlandica*, Mont. Dead shells occ. thrown up on the beaches from Gorran to Land's End; live specs. in trawl refuse and deep water dredgings from Falmouth B., Mount's B., Wolf Rk., and at Scilly from 40 fm. (S. & C.)
197. *M. costata*, J. Adams. Apparently n. unc. along S. coast and at Scilly at 20 to 40 fm.; Harlyn B. (Thelwell); one spec. Bude (Mrs. Clark); dead shells in places c. var. *minor* Montero. Scilly (M.)
198. *Zippora membranacea*, J. Adams. Usually c., at times abund. on the *Zostera* beds along S. coast and at Scilly. var. *minor* Jeffreys, Penzance (M.); var. *venusta* Phil. Mount's B. (Tregelles)
199. *Onoba striata*, J. Adams. F. c., sometimes abund. on most of our rocky shores, grouped together in silt under stones; n. unc. in dredgings in 10 to 40 fm.; Scilly c. var. *aculeus* Gould, Sennen (M.); Land's End
200. *Ceratia proxima*, Alder. Dead shells, Plymouth; n. unc. St. Austell B. to Hayle; under stones from l. w. down to 10 fm.; Crow S. and on Porth Cressa beach, Scilly
201. *Hyala vitrea*, Mont. Dead shells, Plymouth; Looe (J. C.); in 30 fm. off Polperro (Robinson); Falmouth (Hockin); Scilly, St. Mary's S. (M.)
202. *Setia fulgida*, J. Adams. Falmouth; Helford (Rogers); Mount's B.; Scilly, dead shells from St. Mary's S. (M.). var. *pallida* Jeffreys, Helford (Rogers), Mousehole (Baily)
203. *Setia obtusa*, Cantraine. Live specs. occ. on S. coast in deepish water; 2 in 45 fm. off the Dodman! 5 in 20 to 25 fm. Falmouth B.! Fowey (Barlee); Wolf Rk.; from several places at Scilly (M.); one spec. Harlyn B. (Thelwell)
204. *Cingula semistriata*, Mont. Evidently n. unc. in deepish water; occ. dead shells found between t-m. after heavy gales; in 35 fm. off Polperro (Robinson); in 40 off the Dodman! in 15 from Falmouth B.! Land's End; Carbis B.; Harlyn B. (Thelwell); one dead shell, Bude (Miss E. A. Reynolds); off Menavawr, Scilly. var. *pura* Jeffreys, Scilly (M.)
205. *C. trifasciata*, J. Adams. C. in little colonies in thin silt under stones between t-m. on S. coast and at Scilly; often also in fine mud and occ. on sea-weed down to 10 fm.; one spec. Harlyn B. (Thelwell), and a dead shell in a *laminaria* root at Millook near Bude! var. *rupestris* Forbes; shore specs. Falmouth, Mount's B. (Dennis), and St. Mary's, Scilly (M.). var. *graphica* Turton, Scilly (M.)
206. *Galeodina carinata*, da Costa. In 30 fm. off Polperro (Robinson); in 15 fm. Falmouth B.! at Muncoy neck, Scilly (M.); dead shells at times f. c. Plymouth, Fowey, Falmouth, Porthcurnow, and Land's End
207. *Barleeia rubra*, Mont. Dead shells at times n. unc. locally along S. coast and in deep water at Scilly. Live specs. 40 fm. off the Dodman! var. *unifasciata* Mont. Scilly (M.). var. *pallida* Jeffreys, Scilly (M.)
208. *Paludestrina stagnalis*, Baster. C. in brackish water along S. coast; Hayle; and at Scilly (M.). var. *minor* Marshall, Scilly (M.)
209. *P. ventrosa*, Mont. Land's End (Hockin)
210. *Jeffreysia diaphana*, Alder. Among sea-weed at Falmouth, Helford, Mousehole (Dennis), Carbis B.
211. *J. opalina*, Jeffreys. Falmouth (Barlee); Maenporth and Helford (Hockin); Mousehole (Dennis); and Scilly (M.)
212. *Adeorbis subcarinatus*, Mont. Dead shells more c. than live specs.; c. August, 1887, on rocks at l. w. Rame's Cliff Pt. (M.B.A.); Fowey (Peach); Helford, Penzance, and Porthcurnow (Dennis); Land's End (Rogers); Harlyn B. (Thelwell); dead spec. St. Mary's S., Scilly (M.). var. *interrupta* Marshall, Scilly (M.)
213. *Skenea planorbis*, Fab. Under stones and among sea-weed and corallines between t-m.; n. unc. along S. coast and at Scilly. var. *maculata* Jeffreys, Land's End (M.). var. *hyalina* Jeffreys, Land's End and Scilly (M.)
214. *Homalogyra atomus*, Philippi. Very sparingly, in deepish water; 2 specs. in 30 fm. off Polperro (Robinson); in 25 fm. Falmouth B.! in 35 to 40 fm. St. Mary's S., Scilly (M.); St. Mawes (Hockin); Mount's B. (Penzance list), and Land's End (Jeff.)

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215. *Homalogyra rota*, F. & H. In 30 fm. off Polperro (Robinson); Falmouth (Jeffreys); Mousehole (Templer); Land's End (Webster); Carbis B. and St. Mary's S. Scilly (M.)
- [Two specs. of *Truncatella truncata* Mont. both rolled shells, marked Helford in the M.R.I., but their history cannot be traced.]
216. *Capulus hungaricus*, Linn. F. c. in deep water along S. coast, often on *Pecten opercularis*, sometimes on *P. maximus*; Hayle, one young spec. Harlyn B. (Thelwell); only very young dead specs. off Menawawr (S. & C.)
217. *Calyptraea chinensis*, Linn. Often c. between t-m. on stony beaches along S. and dredged to 40 fm.; Scilly (M.)
218. *Trivia europaea*, Mont. Gen. dist. and usually abund. esp. on stony gnd. from l. w. to 30 fm.; on N. coast chiefly represented by dead shells; Scilly, c. var. *minor* Monterosato, Falmouth (James)
219. *Ovula patula*, Pennant. Occ. between t-m. Falmouth; usually in trawl refuse and dredgings from 10 to 40 fm.; n. unc. along S. coast; dead specs. only, off Menawawr (S. & C.)
220. *Erato laevis*, Donovan. N. unc. on coarse sand and gravel along S. coast in 15 to 40 fm.; odd specs. at times cast up along N. coast; n. unc. from deep water outside Menawawr and Shipman Head, Scilly (S. & C.)
221. *Natica sordida*, Philippi. Off Scilly (McAndrew)
222. *N. catena*, da Costa. Dead shells n. unc. along S. and occ. on N. coast; live specs. at times on sandy bottom in Plymouth district, Falmouth and Mount's B.; Scilly
223. *N. alderi*, Forbes. F. c. in clean sand and gravel on S. coast from l. w-m. down to 40 fm.; Hayle, and occ. Perranporth; young specs. at Harlyn B. (Thelwell), and dead shells at times in Widemouth B.! Scilly, c. var. *lactea* Jeffreys, occ. with the type from Polperro to Scilly. var. *subovalis* Jeffreys, Scilly (M.). [var. *ventricosa* Jeffreys, spec. marked Helford in the M.R.I.]
224. *N. montagui*, Forbes. Cornwall (McAndrew); a few off Menawawr, Scilly (S. & C.)
225. *Lamellaria perspicua*, Linn. N. unc. from between t-m. and occ. down to 30 fm. along S. coast; dead shells and stray living specs. along N. coast; a few specs. from Crow S. (S. & C.); var. *lata* Jeffreys, dredged alive in 20 fm. Falmouth B.! Mount's B. (Tregelles)
226. *Velutina laevigata*, Pennant. Occ. dredged from muddy and from sandy gravel; in 30 fm. off Polperro (Robinson); in 15 fm. off Penzance, Falmouth! in 20 fm. off Helford! Porthcurnow (Dennis); Hayle (Hockin), and Mawgan Porth (Perrin); Menawawr, Scilly (S. & C.)
227. *Ianthina rotundata*, Leach. At intervals on most of the northern beaches from Land's End to Marsland mouth, and at Scilly; Mount's B. (Miss E. Carne), and Falmouth (Cocks); gen. as dead shells, but several live specs. from N. coast and Scilly with animal and float in perfect condition
228. *Ianthina exigua*, Lmk. In autumn 1868 many thousands of *Ianthina*, including *I. exigua*, were cast up on the W. beaches at Scilly; Land's End (Turton); Hayle (Hockin)
229. *Bittium reticulatum*, da Costa. Gen. dist., c. on rocky shores along S. and n. unc. on N. coast; at times abund. about l. w. but occ. in great quantity in 40 fm.; Scilly, abund. var. *lactescens* Jeffreys, Land's End (Hockin)
230. *Triforis perversa*, Linn. Live specs. n. unc. in 20 to 40 fm. along S. coast; Harlyn B. (Thelwell), 2 dead shells from Bude! c. in deep water, Scilly (S. & C.). var. *pallescens* Jeffreys, off Menawawr (M.)
231. *Cerithiopsis tubercularis*, Mont. Occ. along S. coast 10 to 40 fm., usually on sponges; abund. in one small area in deep water off the Dodman! and in two little patches 15 and 35 fm. in Falmouth B.! occ. on N. coast; in deep water, Scilly, c. var. *nana* Jeffreys, Menawawr and St. Mary's S. var. *albescens* Marsh., Muncoy neck and Menawawr (M. & also Smart). var. *acicula* Brusina, Scilly (M.). var. *clarkii* Jeffreys, Scilly (M.)
232. *C. sublentia*, Wood. Plymouth S. and in St. Mary's S., Scilly (M.); Falmouth (Hockin). var. *interrupta* Marsh., Scilly (M.). var. *scalaris* Monterosato. Scilly (M.)
233. *C. concatenata*, Conti. Plymouth S. (M.), Land's End (Hockin), and off Menawawr, Muncoy and St. Mary's, Scilly (M.). var. *lactea* Marsh., E. of St. Mary's (M.)
234. *C. Metaxae*, della Chiaje. Land's End and St. Merryn (Hockin); half a dozen dead but perfect shells on gravel off Menawawr (S. & C.). var. *angustissima* Forbes, Scilly (M.). var. *alba* Marsh., Scilly, in 40 fm. (M.)
235. *Scala turtoni*, Turton. Falmouth (J. C.), Land's End (Hockin), Hayle, and in deep water at Scilly
236. *S. clathrus*, Linn. Occ. at l. w-m. on sandy beaches round coast to Hayle; Harlyn B. (Thelwell); n. unc. Scilly
237. *S. trevelyana*, Leach. In trawl refuse at Mewagissey! Falmouth (Cocks); Land's End (McAndrew); dead shells Hayle; Scilly in deep water
238. *S. clathratula*, Adams. Dead shells sometimes cast up on the shore all round coast and occ. dredged from deep water; empty shells not rare at Scilly
239. *S. commutata*, Monterosato. One spec. Porthcurnow (Miss Lavars, *Brit. Conch.* iv, p. 98); 2 at Scilly (M.)
240. *Cioniscus albidus*, G. Adams. In 30 fm. off Polperro (Robinson); Falmouth (Mont.); Helford (M.); Mount's B.; Land's End and Hayle (Hockin); St. Ives (M.); Muncoy neck, Scilly (M.)
241. *Aclis ascaris*, Turton. Eddystone (M.); Helford, Land's End, and Hayle (Hockin); Wolf Rk. (Miss E. Carne); Bude (Lindsay); Muncoy neck, Scilly (M.)

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242. *Aclis minor*, Brown. Fowey (Barlee), Falmouth (Cranch), Sennen (M.), Hayle (Hockin); one shell off Menavawr, Scilly (S. & C.)
243. *Pherusina gulsonae*, Clark. Eddystone (M.); Fowey and Falmouth (Barlee); St. Mawes and Helford (Hockin); Land's End (M.); Muncoy neck and St. Mary's S., Scilly (M.). var. *tenuicola* Jeffreys, Falmouth (M.); Land's End (Hockin), St. Ives (M.); off Menavawr, Scilly (M.)
244. *Cima minima*, Jeffreys. Cawsand B. in 12 fm. and Falmouth in 19 fm. (M.); St. Mawes (Hockin); Penzance (M.); St. Ives (Chaster); one spec. off Menavawr, Scilly (M.)
245. *Odostomia lukisii*, Jeffreys. Penzance at l.w. (M.), Porthgwarra (Dennis); Menavawr and Muncoy neck, Scilly (M.)
246. *O. conoidea*, Brocchi. In 30 fm., Falmouth (Hockin); Mount's B., dead (Tregelles); Menavawr, Scilly (S. & C.). var. *australis* Jeffreys, Falmouth; Scilly (S. & C.)
247. *O. umbilicaris*, Malm. Land's End (Hockin); 3 specs. marked Land's End in the M.R.I.
248. *O. acuta*, Jeffreys. Polperro (Robinson), Looe (Marryat), Falmouth Harb. (Hockin), Mount's B.
249. *O. conspicua*, Alder. Falmouth in 19 fm. (M.); off Menavawr in 40 fm., Scilly (S. & C.)
250. *O. unidentata*, F. & H. Occ. from Polperro to Harlyn B., and off Menavawr, Scilly (S. & C.). var. *elata* Jeffreys, Falmouth Harb. (M.); Scilly (S. & C.)
251. *O. turrata*, Hanley. Falmouth, Mount's B., Land's End (Hockin); one spec. Harlyn B. (Thelwell); off Menavawr, Scilly (S. & C.). var. *striolata* Alder, Land's End (Hockin); Scilly, in 40 fm. (M.). var. *nana* Marsh., Menavawr and St. Mary's S., Scilly (M.)
252. *O. plicata*, Mont. Near Fowey (M.), Penzance (Dennis), Hayle (Hockin), Scilly (M.)
253. *Jordanula nivosa*, Mont. Penzance (Dennis), Porthcurnow (Miss E. Carne), Land's End (Hockin); off Menavawr, Scilly (M.)
254. *J. truncatula*, Jeffreys. Dredged near the Eddystone (Barlee), Falmouth (Miss Vigurs), St. Mawes (Jeff.), Helford and Land's End (M.), Hayle (Hockin); off Menavawr, Scilly (M.)
255. *Liostomia clavula*, Lovén. In 19 fm., Falmouth (M.); in 40 fm. off Menavawr, Scilly (S. & C.). var. *pistilliformis* Brugnone, in 40 fm. Scilly (M.)
256. *Brachystomia albella*, Lovén. Under stones near l. t., Falmouth; Penzance (Dennis); St. Ives! St. Mary's, Scilly (M.). var. *sub-cylindrica* Marsh, Scilly (M.)
257. *B. rissoides*, Hanley. In 30 fm. off Polperro (Robinson); Fowey (M.); Mount's B. (Tregelles); Porthcurnow; Land's End (Jeff.); Harlyn B. (Thelwell); St. Mary's, Scilly (M.). var. *nitida* Alder and var. *glabrata* F. & H., Scilly (M.)
258. *Brachystomia ambigua*, Maton & Rackett. Not infrequently obtained in dredge and trawl chiefly on the ears of *Pecten opercularis* between Plymouth S. and Land's End; 2 dead shells at Padstow! off Menavawr, Scilly (S. & C.). var. *crassa* Thomp., Scilly (M.). var. *angusta* Jeff., Falmouth Harb. (M.); Scilly (S. & C.)
259. *Ondina divisa*, J. Adams. Falmouth Harb. (Hockin), Helford! Mount's B.; 4 spec. Harlyn B. (Thelwell); off Menavawr (S. & C.). var. *tunida* Jeff., in 40 fm., Scilly (M.). var. *laevissima* Sars, St. Mary's S., Scilly (M.)
260. *O. diaphana*, Jeffreys. In 12 fm. Cawsand B. (M.), 30 fm. Polperro (Robinson); at Fowey (Barlee); in 19 fm. Falmouth, and in 40 fm. off Menavawr, Scilly (M.)
261. *O. obliqua*, Alder. Falmouth (Jeff.); Helford; 3 dead shells, St. Ives! in 40 fm. off Menavawr, Scilly (M.)
262. *O. warreni*, Thomp. In trawl refuse Mevagissey! Falmouth; St. Mawes and Helford (M.); Mousehole (Dennis); Land's End; 4 specs. Harlyn B. (Thelwell); off Menavawr and in St. Mary's S. Scilly (M.). var. *intermedia* Marsh., Scilly (M.)
263. *Oda dolioliformis*, Jeffreys. Falmouth (M.); Helford! Land's End and Hayle (Hockin); dead shells, Perranporth! Muncoy neck, Scilly (M.)
264. *Pyrgulina decussata*, Mont. In 30 fm. Falmouth B.! Helford (Hockin), Mount's B. (Penzance List); off Menavawr, Scilly (S. & C.)
265. *P. indistincta*, Mont. Mount's B.; Land's End and Hayle (Hockin); Menavawr, Scilly (S. & C.)
266. *P. interstincta*, Mont. In 30 fm. Falmouth B.! Mount's B. (Tregelles); dead shells, Porthcurnow and Land's End; 3 specs. Mawgan Porth (Perrin); one, Harlyn B. (Thelwell); in deep water, Scilly. var. *terebellum* Philippi, Cawsand B. (M.)
267. *P. fenestrata*, Forbes. Plymouth S. (M.); Fowey (Barlee); Falmouth B. in 30 fm.! Mount's B. (Penzance List); dead shells, Whitesand B., Land's End.
268. *Spiralinella spiralis*, Mont. Dead shells occ. Falmouth to Land's End; Harlyn B. (Thelwell) and from Menavawr, Scilly. var. *coarctata* Marsh., with the type at Scilly, r. (M.)
269. *Miralda excavata*, Philippi. Fowey (Barlee); dead shells at Falmouth and Helford; Mount's B. (Penzance List); one dead shell at Mawgan Porth (Perrin); off Menavawr, Scilly (S. & C.)
270. *Pyrgostelis scalaris*, Philippi. Off the Eddystone (M.); Mount's B. (Tregelles); dead shells at Land's End, and a broken spec. Harlyn B. (Thelwell); off Menavawr, Scilly (S. & C.). var. *rufescens* Forbes, gen. considered a northern form, but found by Smart off Menavawr, Scilly

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271. *Pyrgostelis interrupta*, Totten. The type does not seem to have been found, but the var. *rufa* Philippi has occurred at intervals along the S. coast, probably always as dead shells
272. *Turbonilla lactea*, Linn. Not infrequently round coast from Plymouth S. to Hayle; gen. c. about Falmouth; r. Mawgan Porth (Perrin) and Harlyn B. (Thelwell); off Menavawr, Scilly (S. & C.)
273. *T. pusilla*, Philippi. In 16 fm. Plymouth S. (M.); Fowey; Falmouth; Land's End; 2 specs. Harlyn B. (Thelwell); Menavawr, Scilly (M.). var. *cylindrata* Marsh., Mount's B. (M.). var. *minuscule* Marsh., Mount's B. (M.); Scilly (M.)
274. *T. innovata*, Monterosato. Penzance and Scilly (M.)
275. *T. multilirata*, Monterosato. A single spec. from 40 fm. at Scilly (M.)
276. *Eulimella scillae*, Scacchi. Five dead shells, Land's End (Hockin); one spec. off Menavawr, Scilly (M.)
277. *E. compactilis*, Jeffreys. In 40 fm. off Menavawr, Scilly (M.)
278. *E. commutata*, Monterosato. Falmouth B. in 15 fm. dredged in Mount's B. (Tregelles); Hayle (Hockin); Mawgan Porth (Perrin); Scilly. var. *turris* Forbes, Muncoy, Menavawr, and St. Mary's, found with the type (M.). var. *obeliscus* Jeffreys, off the Eddystone in 30 fm. and in 40 fm. at Scilly (M.)
279. *E. ventricosa*, Forbes. Falmouth (Hockin); Scilly (M.)
280. *E. nitidissima*, Mont. Several times at Falmouth; twice in Mount's B.; once at Padstow (Molesworth); St. Mary's S., Scilly (M.)
281. *Eulima polita*, Linn. N. unc. along S. coast 15 to 40 fm. and occ. thrown up on the beaches; Hayle, Harlyn B. and once, a dead shell, at Widemouth ! r. on gravel off Menavawr, Scilly (S. & C.)
282. *E. curva*, Jeffreys. Menavawr and St. Mary's S. Scilly (M.); first recorded as *E. latipes*, Watson
283. *E. intermedia*, Cantraine. Occ. Falmouth; Scilly (M.). var. *rubro-tincta* Jeffreys, St. Mary's S., Scilly (M.)
284. *E. incurva*, Renier. N. unc. on gravel and among sponges in 5 to 40 fm. along S. coast; Harlyn B. (Thelwell); in deep water off Menavawr, Scilly (S. and C.)
285. *E. gracilis*, Forbes. Scilly (M.)
286. *E. petitiiana*, Brusina. Scilly (M.)
287. *E. (Leiostraca) glabra*, Da Costa. Occ. along S. coast, 10 to 30 fm.; Polperro ! Mevagissey ! Falmouth in trawl refuse (M.R.I.); Nare Pt., Helford (Hockin); dead shells at Porthcurnow
288. *Eulima bilineata*, Alder. Evidently sparsely dist. along S. coast in deepish water; Rame-Eddystone and Eddystone Gnds. (M.B.A.); off Polperro; Falmouth B. ! Mount's B. (Tregelles); Land's End (Hockin); dead shells at Porthcurnow; off Menavawr, Scilly (S. & C.). var. *albida* Marsh., at Scilly (M.)
289. *E. perminima*, Jeffreys. Scilly (M.)
290. *E. monerosati*, de Bourg. Scilly (M.)
291. *Stilifer stylifer*, Turton. Off the Eddystone (M.), Fowey (M.), Falmouth on spines of *Echinus miliaris* (Hockin), Mount's B. on spines of *Echinus esculentus* (Baily)
292. *Caecum imperforatum*, G. Adams. In 15 to 30 fm. at intervals along the S. coast; off Polperro (Robinson); Mevagissey ! Falmouth B.; Mount's B. (Tregelles), Whitesand B., Land's End (Jeffreys); off Menavawr and Muncoy, Scilly (M.); dead shells only, Plymouth
293. *G. glabrum*, Mont. Evidently occurs sparingly along S. coast, 20 to 40 fm.; St. Mary's S., off Menavawr and Muncoy (M.)
294. *Turritella communis*, Lmk. C. locally in muddy sand and gravel, 8 to 10 fm. all along S. coast; dead shells occ. in quantity; Crow S., and on the W. of Bryher, Scilly (S. and C.). var. *nivea* Jeffreys, Mount's B. (Tregelles), dredged with the type at Scilly (S. and C.). var. *gracilis* Jeffreys, Falmouth (M.), dead shells Porthcurnow !
295. *Aporrhais pes-pelecani*, Linn. Obtained occ. along S. coast from l. w-m. down to 40 fm.; locally n. unc. on muddy gravel and sand; twice on beach at Scilly, but never dredged.
- [*A. serresianus*, Michaud. Three specs. of the var. *macandreae* Jeffreys, are marked 'Helford river,' in the M.R.I.]
296. *Buccinum undatum*, Linn. Gen. dist. and in places c. esp. on gravel and coarse sand along S. coast from between t-m. to 40 fm.; old and worn shells occ. on N. coast, and at Scilly; five live specs. St. Mary's (Marshall)
297. *Donovania minima*, Mont. N. unc. along S. coast on gravel in 15 to 40 fm. and occ. under stones near l. w-m.; dead shells picked up at times along N. coast as far as Widemouth B. ! in deep dredgings at Scilly (S. and C.). var. *pallens* Jeffreys, St. Mary's S. Scilly (M.)
298. *Neptunea antiqua*, Linn. Three fine specs. from Helford (Rogers); 2 young dead specs. off Menavawr, Scilly (S. and C.)
- [*Tritonofusus islandicus*, Chemnitz. Two rolled specs. marked 'Falmouth' (M.R.I.)]
299. *T. gracilis*, Costa. Dead shells occ. along S. coast, esp. at Falmouth; Scilly (Lord Vernon). var. *convoluta* Jeffreys, in trawl refuse Mount's B. (Miss Tyacke); 3 specs. Scilly
- [*T. (Siphonorbis) propinquus*, Alder., and the var. *turrita* Sars, Mount's B., through mistaken identification]
300. *T. (Siphonorbis) jeffreysianus*, Fischer. Plymouth (Jordan); trawlers, Mount's B. (Tregelles); 2 worn specs., Scilly (S. and C.)

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301. *Ocenebra erinacea*, Linn. N. unc. and locally abund. between t-m. on stony and rocky beaches along S. coast; a few specs. dredged in 30 fm. in Falmouth B.; dead shells occ. from N. coast; only one live spec., Scilly in deep water (S. and C.)
302. *Trophon muricatus*, Mont. Evidently somewhat sparsely dist. on sand and muddy gravel along S. coast in 12 to 40 fm.; Wolf Rk. and off Menavawr, Scilly (S. and C.); 2 dead shells from Hayle (Hockin). var. *lactea* Jeffreys, Scilly (M.)
303. *T. clathratus*, Linn. Type does not occur; the var. *truncata* Ström, Scilly (Smart and Marshall)
304. *Purpura lapillus*, Linn. C. often abund. round coast and at Scilly on rocks between t-m.; colour vars. numerous and beautiful. var. *imbri-cata* Lmk. Falmouth, Helford, Hayle, New-quay. var. *major* Jeffreys, Helford (Rogers)
305. *Nassa reticulata*, Linn. F. c. along S. coast and at Scilly, and in places abund. in *Zostera* and in muddy gravel; apparently local on N. coast. var. *nitida* Jeffreys, Falmouth (Norman)
306. *N. incrassata*, Ström. F. c. on rocky beaches all round coast near l. w-m. in fine silt in crevices and under stones; c. off the Dodman 40 fm. ! and in Falmouth B. locally down to 30 fm. ! Scilly abund. var. *major* Jeffreys, 3 specs. Falmouth (James); Hayle. var. *minor* Jeffreys, off Menavawr, Scilly (M.). var. *simulans* Jeffreys, Scilly (M.)
307. *N. pygmaea*, Lmk. Under sea-weed and stones near l. w-m.; Gorran Haven! Falmouth, Helford; in dredgings Mount's B. (Tregelles), dead shells at Hayle
308. *Bela turricula*, Mont. From trawl refuse and dredgings in Falmouth B.; Mount's B. (Penzance List)
309. *B. trevelyana*, Turton. Scilly (Miss Hockin)
310. *B. rufa*, Mont. Occ. in trawl refuse; Mevagissey (Dunn), Falmouth (Cocks), Land's End, Wolf Rk. and Scilly. var. *lactea* Jeffreys, St. Mary's S., Scilly (M.). var. *semicostata* Jeffreys, Land's End (Hockin). var. *cranchi* Brown, Falmouth (Cranch)
311. *Haedropleura costata*, Costa. Dead shells occ. in the shell sand all along S. coast and live specs. dredged in 15 to 30 fm. Falmouth B., Mount's B., and in 40 fm. off Menavawr, Scilly (S. and C.)
312. *Mangilia striolata*, Scacchi. Falmouth and Land's End (Hockin); Mount's B. (Tregelles)
313. *M. attenuata*, Mont. About Plymouth occ. in 20 to 30 fm. on muddy gravel (M.B.A.); Falmouth Harb. (Hockin); Crow S., Scilly, one spec. (S. and C.)
314. *M. costata*, Donovan. Evidently n. unc. from 20 fm. downwards along S. coast; single specs. occ. at l. s. t.; dead shells at times f. c.; Harlyn B. (Thelwell); in deep water off Menavawr c. (S. and C.). var. *coarctata* F. and H., Scilly (M.)
315. *Mangilia rugulosa*, Philippi. First found in England by Hockin at St. Merryn in 1865; Padstow (Goodall); one 'young and fresh' example Muncoy neck, Scilly (M.)
316. *M. brachystoma*, Philippi. Falmouth Harb. (Hockin); identified in sand from Mount's B. by Chaster; 2 specs. Harlyn B. (Thelwell); Scilly (M.)
317. *M. nebula*, Mont. One spec. Queen's Gnd., Plymouth (M.B.A.); occ. about Falmouth, Helford and Mount's B.; at Land's End (Hockin); 1 spec. at Harlyn B. (Thelwell); Crow S. and off Menavawr, Scilly (S. & C.). var. *laevigata* Philippi, Helford (Hockin); Marazion (Miss Hockin). var. *vittata* Norman, 1 large spec. quite 5 mm. long at Scilly (S. & C.). var. *elongata* Jeffreys, Scilly (M.)
318. *M. (Teres) anceps*, Eichwald. In 30 fm. off Polperro (Robinson); Helford and Wolf Rk. (Hockin) rr. in deep water; Scilly (S. & C.)
319. *M. (Bellardiella) gracilis*, Mont. Evidently gen. dist. and in places at least f. c., esp. on muddy and sandy gravel along the S. coast at 15 to 40 fms.; dead shells, Hayle and Padstow! n. unc. in the Menavawr dredgings at Scilly
320. *Clathurella leufroyi*, Michaud. The type does not occur, but the var. *boothi* Brown has been found at Looe (J. C.), 40 fm. off the Dodman! in 25 fm. Falmouth B.! Falmouth Harb. (Hockin); at Land's End (J. C.); and St. Mary's S. Scilly (M.)
321. *C. linearis*, Mont. At intervals along the S. coast, 5 to 40 fm. and locally n. unc.; Wolf Rk. (Miss E. Carne); Mawgan Porth (Perrin); Harlyn B. (Thelwell); off Menavawr c. (S. & C.). var. *alba* Marsh., in 40 fm. at Scilly; Land's End r. (M.)
322. *C. reticulata*, Renier. A few specs. in 30 fm. off Polperro (Robinson); off Gorran Haven! at Falmouth (Hockin); in St. Mary's S., Scilly (M.). var. *asperrima* F. & H. Falmouth; Scilly (M.)
323. *C. purpurea*, Mont. Occ. on stony bottoms and in rocky chinks from l. t. down to 40 fm. along the S. coast and at Scilly. Dead shells in shell sand, r. round to Hayle and at Padstow! one at Bude! var. *Philberti* Michaud, a fragment at Scilly (S. & C.)

TECTIBRANCHIA

324. *Actaeon tornatilis*, Linn. Dead shells not infrequent along S. coast, and occ. on the N.; live specs. in quantity on muddy sand in 12 fm. off Penzance, Falmouth B.! dredged in Mount's B. (Tregelles); Crow S., and in thick mud under Round Is., Scilly (S. & C.)
325. *Tornatina mammillata*, Philippi. Dead shells found sparingly at Plymouth and in Whitsand B.; in 30 fm. off Polperro! in 25 fm. Falmouth B.! in Mount's B., Land's End, and on beach at Guthers, Scilly

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326. *Tornatina truncatula*, Bruguière. Dead shells not infrequently found along S. coast; and at Mawgan Porth (Perrin), and Harlyn B. (Thelwell); live specs. in 30 fm. off Polperro (Robinson); in 40 fm. off the Dodman! in Falmouth B. on the Menavawr gravels abund. (S. & C.). var. *pellucida* Brown, Scilly (M.)
327. *T. obtusa*, Mont. Helford; Mount's B. (Penzance List); Hayle (Hockin); Crow S. and at Guthers, Scilly, but r. (S. & C.). var. *lajonkai-reana* Bast. Scilly with the type (S. & C.)
328. *T. nitidula*, Lovén. Scilly (M.)
329. *T. umbilicata*, Mont. Dead shells, Falmouth; in 12 fm. off Pennance! Mount's B.; Hayle (Hockin); Crow S., Scilly c. (S. & C.)
330. *Diaphana expansa*, Jeffreys. Several dead specs. obtained by Marshall off Menavawr, the first English record
331. *D. hyalina*, Turton. Obtained occ. in trawl refuse, occ. in the stomach of *Trigla lyra*; Mevagissey! Falmouth (Cocks); Helford! Porthcurnow, dead shells; Land's End (Hockin); 1 or 2 only, deep water, Scilly (S. & C.)
332. *Scaphander lignarius*, Linn. C. on most of the trawling gnds. along S. coast; in muddy sand in 12 fm. off Pennance, and in 10 fm. off Helford river! occ. in sand at l. s. t.; sometimes at Hayle, and sparingly at Scilly. var. *alba* Jeffreys, Mount's B. (Tregelles) and Hayle (Miss Hockin)
333. *Volvulella acuminata*, Bruguière. Dead shells round Plymouth and off Polperro! off Nare Pt., Helford (Hockin)
334. *Bullinella cylindracea*, Pennant. N. unc. locally on S. coast in muddy sand; near Fowey! in Falmouth Harb. (Mont.); in 12 fm. off Pennance! in Mount's B. (Tregelles); n. unc. Hayle; v. c. on muddy patch in 8 fm., Padstow B. Crow S., Scilly (S. & C.)
335. *Haminea hydatis*, Linn. Occ. abund. in *Zostera* beds and in muddy sand in shallow water on S. coast, and at Scilly; very local, Plymouth; in 1902 v. abund. Falmouth, in 1903 and 1904 rr., in 1905 none found!
336. *Roxania utriculus*, Brocchi. One spec. off Penlee Pt. (M.B.A.); Falmouth (Hockin); in 12 fm. off Pennance! Mount's B. (M.)
337. *Acera bullata*, Müller. Occ. about Falmouth and Helford; Scilly (Lord Vernon and A. H. Cooke). Vallentin obtained young specs. at Falmouth in the sub-genital pits of *Aurelia aurita*
338. *Philine scabra*, Müll. One spec. Whitsand Bay (M.B.A.); Falmouth; Mount's B.; Hayle (Hockin); one at Mawgan Porth (Perrin); dead shells c. in Crow S., Scilly (S. & C.). var. *circa* Marsh., dredged off Muncoy, Scilly (M.)
339. *P. catena*, Mont. In 40 fm. off the Dodman! in 20-25 fm. Falmouth B! Mousehole (Dennis); Porthcurnow, dead shells; Land's End (Hockin); 1 spec. Harlyn B. (Thelwell); in St. Mary's S. and off Menavawr, Scilly (M.). var. *zona* Jeffreys, off Menavawr, Scilly (M.)
340. *Philine angulata*, Jeffreys. St. Ives and Scilly (M.). var. *circumlustra* Marsh., off the Eddy-stone in 28 fm. (M.)
- [*P. quadrata*, S. V. Wood. Marked as Cornish by Hockin, but no authentic spec. has been preserved]
341. *P. punctata*, J. Adams. N. unc. locally along S. coast from shallow water down to 40 fm.; Hayle and among *Obelia* at Padstow! Scilly (Jenkinson). var. *cingulata* Marsh., Sennen, and St. Mary's S., Scilly (M.)
342. *P. pruinosa*, Clark. Falmouth (Miss Vigurs); St. Mary's S., Scilly (M.)
343. *P. nitida*, Jeffreys. Mount's B. (Chaster and Burkill)
344. *P. aperta*, Linn. C. on sand, and esp. on muddy sand round coast to Hayle; c. Padstow B., 1902! Scilly (Jenkinson)
- [*Colpodaspis pusilla*, M. Sars. A spec. February 1893 on rough ground about 2 m. S. of the Mewstone, Plymouth S. (M.B.A.)]
345. *Limacina retroversa*, Fleming. Falmouth Harb. (Hockin); Mount's B. (Penzance List); Menavawr, Muncoy and St. Mary's S., Scilly (M.). var. *macandreae*, F. & H. Scilly (M.)
- [*Cavolinia trispinosa*, Lesueur. Marked as Cornish by Hockin, but no spec. preserved]
346. *Aplysia punctata*, Cuvier. N. unc. along S. coast at l. t-m., and in shallow water; sometimes abund. about Falmouth among *Zostera*; very fine on St. Martin's Flats, Scilly (M.)
347. *Clione limacina*, Phipps. Pelseneer (Challenger Report) says: 'There is in the coll. of the Muséum d'Histoire Naturelle of Paris a spec. from Falmouth, presented by Leach' (Norman)
348. *Pleurobranchus plumata*, Mont. N. unc. locally along S. coast from under stones at l. w-m. down to 25 fm.; dredged in the roadstead, St. Mary's, Scilly (S. & C.)
349. *Oscanius membranaceus*, Mont. Very variable in numbers along the S. coast from the *Zostera* beds down to 30 fm.; Scilly, on *Zostera* off Carn Nea (S. & C.)
350. *Runcina coronata*, Quatrefages. Small specs. abund. below Plymouth Hoe, Apr. 1889 (M.B.A.); in tidal pools between Gyllyngvase and Swanpool, April, 1901!

NUDIBRANCHIA

351. *Hermaea bifida*, Mont. Four specs. at different times on the Cornish side of Plymouth S. (M.B.A.)
352. *H. dendritica*, A. & H. One near Polperro (Robinson); 4 from the Devonshire side of Plymouth S., 2 Drake's Is. (M.B.A.)
353. *Stiliger bellulus*, d'Orb. Ten specs. dredged in Cawsand B., 3 August, 1892 (M. B. A.); had previously been lost to science for sixty years
354. *Elysia viridis*, Mont. Queen's Gnd, Plymouth S. (M. B. A.); 3 in tide pool near Mevagissey!

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355. *Limapontia capitata*, Müller. Abund. in tide-pools, Cawsand B., c. on corallines, Drake's Is. (M. B. A.); c. Gyllyngvase, Falmouth (Cocks)
356. *Acteonia corrugata*, A. and H. Gyllyngvase, Falmouth (Cocks)
357. *Cenia cocksi*, A. and H. In pools between t-m. Falmouth (Cocks)
358. *Aeolidia papillosa*, Linn. Usually c. along S. coast but very variable. In March, 1892, the bar at Helford literally swarmed with them, but a year later not one spec. could be seen (V.). In April, 1901, many thousands in sea-weed near Porthscatho; a year later only three specs. could be found! Scilly
359. *Aeolidella glauca*, A. and H. Queen's Gnd. and once from Mt. Edgcumbe (M. B. A.); near Polperro! Falmouth (Cocks)
360. *A. alderi*, Cocks. Plymouth S.; under stones in pools between t-m. Falmouth, r. (Cocks)
361. *Berghia caerulea*, Guérin Meneville. Outside Plymouth Breakwater (M. B. A.)
362. *Cuthona aurantia*, A. & H. A few times in Plymouth S. (M.B.A.), once at Fowey (Alder)
363. *Cratena amoena*, A. & H. Occ. Plymouth S. (M.B.A.), several specs. at Fowey in 1847 (A. and H.)
364. *C. viridis*, Forbes. Rame-Eddystone and Eddystone Gnds. (M.B.A.); off Polperro in 30 fm. (Robinson); Cornwall in 25 fm. (Forbes)
365. *C. olivacea*, A. & H. Occ. Queen's Gnd. and elsewhere in Plymouth S. (M.B.A.); one on the hulks at Falmouth, Oct. 1891 (V.); Penzance (Alder)
366. *C. peachi*, A. & H. Fowey (Peach); 2 specs. S. of Plymouth S. (M.B.A.)
367. *C. couchi*, Cocks. One spec. on the under surface of a stone at extreme l. s. t., Gyllyngvase, Falmouth (Cocks)
368. *Tergipes despectus*, Johnst. Barnpool and Duke rock, Plymouth S.; Fowey (Alder); v. c. March, 1904, at Mevagissey! at Gorran Haven in spring 1900! at long intervals c. at Falmouth
369. *Embletonia pulchra*, A. and H. A single spec. on Asia shoal, Plymouth S. (M.B.A.)
370. *Amphorina coerulea*, Mont. N. unc. on Asia shoal, Queen's Gnd.; dredged on Rame-Eddystone and Mewstone-Eddystone Gnds., and off Tregantle (M.B.A.); in 30 fm. off Polperro (Robinson)
371. *Galvina cingulata*, A. & H. Plymouth S.; Mevagissey, several among sea-weed 1902!
372. *G. picta*, A. & H. C. on *Zostera*, Cawsand B., on Asia shoal and Queen's Gnd., Plymouth (M.B.A.); one on piles in Fowey Harb. ! one on a moored hulk, Falmouth Harb. (V.)
373. *G. tricolor*, Forbes. F. abund. on the trawling gnds. around Plymouth in 20-35 fm. (M.B.A.); several found by different collectors, Falmouth; c. in 1902, 18-25 fm. off Helford!
374. *Galvina exigua*, A. & H. Plymouth S. (M.B.A.); Fowey (Alder); Mevagissey! Falmouth; v. abund. Helford, Aug. 1849, and July, 1904!
375. *Coryphella rufibranchialis*, Johnst. F. c. on the inner trawling gnds., Plymouth S. (M.B.A.); in 20 fm., Whitsand B. (M.B.A.); occ. in trawl refuse Mevagissey! Falmouth (Cocks); Mount's B. (Tregelles)
376. *C. smaragdina*, A. & H. In Millbay Chan. and on Asia shoal, May, 1898 (M.B.A.)
377. *C. lineata*, Loven. Rame-Eddystone Gnds. (M.B.A.)
378. *C. landsburgi*, A. & H. Occ. Plymouth S. and outside (M.B.A.); off Polperro (Robinson); several on a large stone covered with hydroids and polyzoa from deep water off St. Mawes Castle (V.)
379. *Favorinus albus*, A. & H. Drake's Is., Cawsand B. and in Barnpool on *Fucus* (M.B.A.); in rock-pools near Gorran Haven! Falmouth
380. *Facelina coronata*, Forbes & Goodsir. Cawsand B. (M.B.A.); off Polperro (Robinson); Fowey (A. & H.); c. Mevagissey at intervals! Falmouth (V.)
381. *F. drummondi*, Thompson. Queen's Gnd. and Cawsand B. (M.B.A.)
382. *F. punctata*, A. & H. Cawsand B. and rocky gnd. off Penlee (M.B.A.); at times f.c. Fowey to Gorran Haven! often c. at Falmouth (V.), several at Helford, Nov., 1905!
383. *Calma glaucoides*, A. & H. Once on Queen's Gnd. and frequently obtained in the W. entrance of Plymouth S. among goby eggs, which apparently constitute a congenial habitat (M.B.A.); off Gorran Haven in large shells of *Buccinum undatum* along with eggs of the goby or butterfly blenny! (See J.M.B.A. vol. vii, p. 281)
384. *Fiona marina*, Forskal. Two specs. at l. w-m. Bar Pt., Falmouth, in 1849 (Cocks)
385. *Antipella cristata*, della Chiaje. Queen's Gnd. and Eddystone Gnds. (M.B.A.); casual specs. Polperro, Fowey, Mevagissey, Falmouth, Helford; spawning in great number at Fowey in early Sept. 1902! In Oct. 1891, literally swarmed on the sides of the hulks at Falmouth (V.); and in Sept. 1895 some large balks of creosoted timber under the eastern breakwater that were dry for at least an hour each tide were fairly sprinkled with specs. of exceptional size, which disappeared early in Oct. (V.)
386. *A. hyalina*, A. & H. Several small specs. on Queen's Gnd., Plymouth S., also 2 to 4 m. NE., of the Eddystone (M.B.A.)
387. *Hero formosa*, Loven. Outside Plymouth Breakwater and on the Eddystone Gnds.; has not been seen there since 1898 (M.B.A.)
388. *Lomanotus marmoratus*, A. & H. Plymouth S. (M.B.A.); 2 specs. on *Antennularia* near Mevagissey!

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389. *Lomanotus portlandicus*, Thompson. Very scarce; 3 m. SSW. of Rame Hd., young spec. on *Antennularia*, Queen's Gnd. (M.B.A.)
390. *Doto fragilis*, Forbes. C. on *Antennularia* on the outside gnds. at Plymouth, less frequent in the Sound (M.B.A.); c. off Polperro and the Dodman! Fowey (Alder); Mevagissey! Falmouth, r. (V.); f. c. in 20 fm. off Helford! 4 specs. Newquay (V.)
391. *D. pennatifida*, Mont. Gen. dist. and c. on *Antennularia*, Plymouth S. and outside (M.B.A.); n. unc. locally off Polperro and Mevagissey!
392. *D. coronata*, Gmelin. F. c. at most of the dredging stations round Plymouth on *Antennularia* (M. B. A.); Mevagissey and Gorran Haven! c. Falmouth (V.); at times abund. Helford!
393. *Hancockia eudactylota*, Gosse. Cawsand B. on *Zostera* and *Laminaria* (M. B. A.)
394. *Dendronotus frondosus*, A. & H. Occ. Plymouth S.; on Queen's Gnd.; 1 large spec. in the Tamar near Saltash; on Eddystone and Rame-Eddystone Gnds. (M. B. A.); off Mevagissey and off the Dodman in deep water! Falmouth 8 specs. on the bottom of a dredger, Aug. 1891 (V.)
395. *Scyllaea pelagica*, Linn. 3 specs. found on *Laminaria bulbosa* at Bar Pt. Falmouth after a storm in 1845 by Cocks
396. *Pleurophyllidia loveni*, Bergh. A single spec. 2 m. N. of the Eddystone (M.B.A.)
397. *Tritonia hombergi*, Cuvier. C. on the outer trawling gnds. round Plymouth S., Eddystone Gnds. (M.B.A.); occ. specs. in 40 fm. off the Dodman! c. on the trawling gnds. N. of the Longships, Land's End (Garstang)
398. *T. (Candiella) plebeia*, Johnst. Rame-Eddystone and Eddystone Gnds. (M.B.A.); in 35 m. off Polperro (Robinson)
399. *Archidoris tuberculata*, Cuvier. N. unc. between t-m. on most rocky shores on S. coast and at Newquay (V.) and Widemouth B. on the N.! at times abund. in dredgings to 40 fm. Scilly
400. *A. flammea*, A. & H. Two specs. Plymouth S. (M.B.A.); scarce between t-m. Falmouth (V.)
401. *Rostanga coccinea*, A. & H. Occ. between t-m.; Downderry (M.B.A.); Fowey, Mevagissey and Gorran Haven! Falmouth (Cocks); deep water, Polperro (Robinson), and Trefusis P., Falmouth Harb. (V.)
402. *Jorunna johnstoni*, A. & H. Occ. between t-m. on rocky and stony shores; Plymouth S., Mevagissey! Gorran Haven! Falmouth
403. *Platydorid testudinaria*, Risso. Barnpool, Mt. Edgcumbe; Queen's Gd. v. occ.; Rame-Eddystone Gnds. (M. B. A.); in trawl refuse, Mevagissey, r.!
404. *Aegires punctilucens*, d'Orb. Queen's Gnd. and Eddystone Gnds. (M. B. A.); off Polperro (Robinson); Pridmouth near Fowey (Peach); occ. in deep water, Falmouth (V.), on the fronds of *F. serratus* &c. l. s. t. Gyllyngvase (Cocks)
405. *Triopa clavigera*, Müll. Eddystone Gnds. (M. B. A.); in 20 fm. off Polperro! Fowey (Alder); Mevagissey! Falmouth, in deep water (V.); Helford, n. unc.
406. *Thecatera pennigera*, Mont. Cornwall (R. Q. C.); Queen's Gnd., Plymouth; 1 spec. in 20 fm. off Rame Hd. (M. B. A.); sparingly in deep water, Whitsand B.! under a stone near l. w., Pentewan beach! Falmouth, deep water (V.)
407. *T. virescens*, A. & H. 2 specs. found by Cocks at Bar Pt., Falmouth, 1849
408. *T. capitata*, A. & H. Dredged in 25 fm. off St. Ives, 1853 (Barlee)
409. *Palio lessoni*, d'Orb. The var. *ocellata* A. & H. Queen's Gnd. and Mt. Edgcumbe (M. B. A.), Fowey! Falmouth in tidal pools, and in deep water (V.)
410. *Polycera quadrilineata*, Müll. Usually c. on *Zostera* beds along the S. coast as far W. as Coverack and Mount's B., and frequently dredged down to a depth of 40 fm. At end of Oct. 1895 Vallentin found numbers depositing their imperfect coils of spawn on the *Zostera* in Falmouth docks.
411. *Acanthodoris pilosa*, Müll. Occ. between t-m. along S. coast, and in places n. unc. in deepish water; Queen's Gnd. and 2 m. N. of the Eddystone (M. B. A.); in 20 fm. off Polperro! off Mevagissey! in Mount's B. (Tregelles)
412. *Lamellidoris aspera*, A. & H. Plymouth S. (M. B. A.); in shallow water off Polperro (Robinson)
413. *L. bilamellata*, Linn. C. Plymouth S. (M.B.A.); off Polperro (Robinson); at Mevagissey!
414. *L. diaphana*, A. & H. R. along the Falmouth beaches at l. s. t. (Cocks)
415. *L. depressa*, A. & H. Once on the inner side of the Plymouth Breakwater (M. B. A.)
416. *L. pusilla*, A. & H. Plymouth (M. B. A.); twice found by Cocks at extreme l. t-m., Gyllyngvase, Falmouth
417. *L. oblonga*, A. & H. Evidently abund. at times on *Cellaria*, Rame-Eddystone and Eddystone Gnds. (M. B. A.); v. c. Mevagissey in March 1902, but not seen there since April of that year!
418. *Goniodoris nodosa*, Mont. F. c. and at times locally abund. as a littoral species along S. coast, often sheltering under clumps of *fuci* left exposed by the tide; in April 1900 v. abund. near Gorran Haven! and in 1902 at Polperro! in March 1892 v. c. at Helford (V.); often dredged down to 25 fm.
419. *G. castanea*, A. & H. Cawsand B. and Rame-Eddystone Gnds. (M.B.A.); occ. specs. Fowey! Gorran Haven! Falmouth. In Dec. 1891 an extraordinary number appeared on the coal hulks at Falmouth, of a rich dark-red colour, hardly distinguishable from the tunicate *Leptoclinum gelatinosum* on which they were feeding. In many cases they deposited their coils of spawn about three inches under the water line

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420. *Idalina elegans*, Leuckart. Recorded by Spence Bate for the Cornish coast
421. *I. (Idaliella) aspersa*, A. & H. 1 spec. off Penlee Pt. (M. B. A.)
422. *I. (Idaliella) pulchella*, A. & H. 1 spec. dredged off St. Ives in 1853 (Barlee)
423. *Ancula cristata*, Alder. Cawsand B. (M. B. A.); under stones on Pentewan beach, n. unc. Feb. 1901! several obtained at l. s. t. off Trefusis Pt., Falmouth Harb. (V.); found by Cocks not infrequently on the Falmouth beaches

PULMONATA

424. *Otina otis*, Turton. V. abund. and gregarious in rock crevices in a cave under Rame Cliff Pt. (M. B. A.); Lizard and Tintagel (Cooke); Mousehole; Land's End (Hockin); Piper's Hole, Tresco, c. (S. & C.). var. *candida* Jeffreys, Sennen. var. *alba* Cooke, Newquay (Cooke)
425. *Leuconia bidentata*, Mont. Local along the S. coast in crevices near h. w. m. and under stones between t-m.; Hayle Towans (Hennell); Scilly, n. unc.
426. *Alexia denticulata*, Mont. Mevagissey! Falmouth (Cocks); Porthcurnow (Hennell); Scilly (Jordan). var. *myosotis* Drap., Truro (King); Penzance, Porthcurnow, and Whitsand B., Land's End (Hennell); dead shells at Scilly
427. *Oncidiella celtica*, Cuv. Whitsand B., E. (Spence Bate); Lantivet B. in crevices of the rocks a little above h. w. m., apparently feeding on *Lichina pygmaea* (Laughrin)
429. *Todaropsis eblanae*, Ball. 1 spec. from the neighbourhood of Plymouth (M. B. A.)
430. *Spirula perroni*, Lmk. Dead shells not infrequently cast ashore on the Cornish beaches from Pendower to Padstow and on Scilly
431. *Loligo forbesi*, Steenstrup. Evidently of gen. occ. along S. coast, but irregular in its appearance; occ. some little way up the tidal rivers; Scilly, July 1903, c.!
432. *L. media*, Linn. St. John's Lake, Hamoaze; Cawsand B.; Whitsand B. (M. B. A.); Polperro! Mevagissey! Falmouth; St. Ives! St. Mary's S., Scilly, July 1903!
433. *L. marmorae*, Verany. One spec. off the Draystone, Plymouth (M.B.A.)
434. *Sepia officinalis*, Linn. Gen. dist. along S. coast and usually c. in bays and estuaries in July; Scilly, c.
435. *S. elegans*, d'Orb. N. unc. at times along S. coast in trawl refuse; one at Padstow, May 1900!

[*S. d'Orbignyana*, Ferussac. Twice reported from St. Austell B. but not confirmed]

436. *Sepioloa scandica*, Steenstrup. A single spec. Plymouth S., Nov. 1887, and another off the Mewstone, Oct. 1899 (M.B.A.)
437. *Rossia macrosoma*, delle Chiaje. Two specs. Plymouth S., autumn 1892, and occ. taken on the trawling gnds. (M.B.A.), once, Mount's B.!
438. *Polypus vulgaris*, Lmk. As a rule sparingly dist. along coast, but occ. abund. In 1900 abund. outside Falmouth Harb. and several caught at Malpas near Truro! Scilly
439. *Moschites cirrosa*, Lmk. Not infrequent on trawling gnds. and in lobster pots along S. coast and at Scilly; 2 near Widemouth B., July, 1905!

CEPHALOPODA

428. *Ommastrephes sagittatus*, Lmk. *Illex coindetii*, Verany. It is impossible to say to which of these two species the examples recorded by Laughrin from Polperro and by Cocks from Falmouth belong

TUNICATA

The Tunicates of the Cornish seas are usually abundant both in numbers and species, but the impossibility of identifying the majority of them greatly restricts the dimensions of the accompanying list. Several very common compound ascidians in Falmouth Bay are known at Truro only by the names the students have invented. Fortunately the compound ascidians collected by Dr. Cocks in the neighbourhood of Falmouth were named by Milne-Edwards, otherwise the list would have been a great deal smaller than it is. The classification and nomenclature followed is that of Herdman in 'A revised Classification of the Tunicates' (*Trans. Linn. Soc.* 1891).

1. *Molgula oculata*, Forbes. Eddystone Gnds. (M.B.A.); n. unc. locally around Falmouth and in trawl refuse from Helford
2. *M. simplex*, Alder and Hancock. N. unc. on *Chaetopterus* tubes on the Eddystone Gnds. (M.B.A.)
3. *M. citrina*, A. & H. Occ. in Falmouth B.
4. *Cynthia dura*, Heller. One damaged spec. in trawl refuse Mevagissey, showing the six branchial folds and the lanquets at the posterior end!
5. *Cynthia morus*, Forbes. Fowey; f. c. Pennance, Falmouth, May 1900! in 25 fm. Mount's B. (Forbes and McAndrew); Scilly (Carus)
6. *C. squamulosa*, Alder. Two specs. Scilly 1903, both showing the inner surface of the test white and soft!
7. *C. quadrangularis*, Forbes. Scilly (Carus)
8. *Pelonia corrugata*, Forbes. Occ. Falmouth B.
9. *P. glabra*, Forbes. From trawl refuse, Helford river (Cocks). In Falmouth B. a smooth pilose brownish yellow form has been taken which evidently belongs to this species!

A HISTORY OF CORNWALL

10. *Forbesella tessellata*, Forbes. Rame-Eddystone Gnds.; a single spec. Eddystone Gnds. on fine gravel (M.B.A.); trawl refuse, Mevagissey! Falmouth B. scarce! in 25 fm. Mount's B. (Alder). [*C. limacina*, Forbes, from 25 fm. Mount's B. (Forbes and McAndrew) and from Scilly (Carus), may be a var. of this species]
11. *Styelopsis grossularia*, van Beneden. Abund. on rocks between t-m. Mt. Edgcombe; occ. in dredgings from Queen's Gnd., n. unc. particularly on *Pecten* shells on the gravels W. of Eddystone (M.B.A.); f. c. locally, Falmouth B.
12. *Polycarpa rustica*, L. N. unc. Falmouth B.; Scilly (Carus)
13. *P. pomparia*, Savigny. Eddystone Gnds., on one occ. v. plentiful 4 m. WNW. of the Eddystone (M.B.A.)
14. *Corella larvæformis*, Hancock. Off the Eddystone (M.B.A.)
15. *C. parallelogramma*, Müll. Two specs. Devonshire side of Plymouth district (M.B.A.); Scilly (Carus)
16. *Phallusia mamillata*, Cuv. N. unc. Devonshire side of Plymouth district (M.B.A.); Polperro! Gyllyngvase, Falmouth!
17. *Ascidia venosa*, Müll. Occ. specs. on the Eddystone Gnds. (M.B.A.); Falmouth B. sparingly, 5 to 25 fm.!
18. *A. aspersa*, Müll. Locally c. Plymouth S. (M.B.A.); Sennen Cove! Scilly (Carus)
19. *A. arachnoidea*, Forbes. N. unc. on Cornish Coast (Alder)
20. *A. scabra*, Müll. Gen. present on Eddystone Gnds. but spec. abund. where *Sertularella Gayi* is plentiful; Rame-Eddystone Gnds. (M.B.A.); c. in about 40 fm. off the Dodman! Falmouth B.! Scilly (Carus)
21. *A. albida*, A. & H. In trawl refuse from Falmouth Harb. (Cocks); Helford! (May be a var. of the preceding species)
22. *A. conchilega*, Müll. N. unc. in Falmouth Harb. and not infrequently cast up in Falmouth B. during a storm
23. *A. prunum*, Müll. F. c. locally, Falmouth B.
24. *A. mentula*, Müll. Devonshire side of Plymouth district (M.B.A.); n. unc. Falmouth Harb. and B.; Scilly (Carus)
25. *A. depressa*, Alder. Bolt Hd. (M.B.A.); n. unc. Falmouth B. (Cocks)
26. *A. pustulosa*, Alder. Dredged by Alder in Fowey Harb.
27. *A. elliptica*, A. and H. Under stones at l.w-m., St. Mary's Chan. Scilly
28. *A. pellucida*, A. & H. Under stones between t-m., Gorran; at l. s. t. Falmouth (Cocks)
29. *A. sordida*, A. & H. Attached to hydroids in shallow water, Polperro and Falmouth B.
30. *A. vitrea*, van Ben. Occ. Falmouth B. (Cocks)
31. *Ciona canina*, Müll. N. unc. Falmouth B.; Scilly!
32. *C. intestinalis*, L. Comparatively r. in Plymouth district till 1901 when it became v. abund. in Millbay docks (M.B.A.); Fowey! sometimes c. in Falmouth Harb. and B.; plentiful Newquay, 1905! Scilly!
33. *Diazona violacea*, Sav. Eddystone Gnds. (M.B.A.); in 20 fm. off Helford!
- [*Perophora banyulensis*, Lahille. Duke Rk. Plymouth (M.B.A.)]
34. *P. listeri*, Wiegmann. Queen's Gnd., Asia shoal (M.B.A.); Polperro! Fowey, on the fronds of *fucus*! n. unc. Falmouth B. and Harb.; Mount's B.
35. *Pycnoclavella aurilucens*, Garstang. Plymouth S. and at Mewstone (M.B.A.)
36. *Clavelina lepadiformis*, Müll. Occ. at extreme l. t. Drake's Is., Queen's Gnd. Mt. Edgcombe, rr. in 10 to 15 fm. off Penlee (M.B.A.); in shallow water, Polperro! in Falmouth Harb. and B.; Scilly
37. *Distapelia rosea*, Della Valle. On stones and dead shells in the Plymouth district (M.B.A.)
- [*Archidistoma aggregatum*, Garstang. V. abund. Duke Rk., Plymouth]
38. *Distoma rubra*, Sav. On stones, in pools, and on laminarian stems, Gyllyngvase, and Pennance (Cocks).
39. *D. crystallinum*, Ren. Sennen B., Land's End!
40. *Aplidium zostericola*, Giard. Attached to stalks of *Bowerbankia* or *Amathia*, Plymouth (M.B.A.)
41. *A. fallax*, Johnst. Attached to rocks and the under surface of stones, Falmouth B. (Cocks)
42. *A. ficus*, Linn. Trawl refuse, Bream B. sands, Falmouth, r., Helford river, c. (Cocks)
43. *A. nutans*, Johnst. N. unc. on rocks and under-surface of stones, Falmouth B. (Cocks)
44. *Amouroucium albicans*, Milne-Ed. Off the Mewstone, Plymouth (M.B.A.); on stems of young *Fucus serratus* and the under surface of stones, Falmouth (Cocks)
45. *A. noramanni*, Milne-Ed. One spec. Church Reef, Wembury B., Plymouth (M.B.A.); c. in pools at Falmouth on stones and shelving rocks (Cocks); Falmouth (Alder)
46. *A. proliferum*, Milne-Ed. On stones and rock-sides in pools at l.w-m., Falmouth, c. (Cocks); n. unc. in Cornwall (Alder)
- [*A. punctum*, Giard. A single colony 3 m. S. of Mewstone (M.B.A.)]
47. *Morchellium argus*, Milne-Ed. C. everywhere in Plymouth district on rocks between t-m. (M.B.A.); Polperro! Fowey! c. at l.w-m. Falmouth and Mount's B.; Sennen!
48. *Morchelliodes alderi*, Herdman. On stones, shells, and roots of *Laminaria*, Asia shoal, Plymouth (M.B.A.)
- [*Fragarium elegans*, Giard. Duke Rk., Plymouth, on stones (M.B.A.)]

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49. *Circinalium concretsens*, Giard. Drake's Is., on reef leading to the Bridge, on roots of *Laminaria* at extreme l.w. (M.B.A.)
50. *Leptoclinium durum*, Milne-Ed. Several small colonies conspicuous by their yellow colour on laminarian roots at Sennen !
51. *L. maculosum*, Milne-Ed. C. on laminarian roots in shallow water at Scilly !
52. *L. asperum*, Milne-Ed. N. unc. on roots of *Laminaria* and *Cystoseira ericoides*, Falmouth (Cocks)
53. *L. aureum*, Milne-Ed. N. unc. after heavy weather about Falmouth (Cocks)
54. *L. gelatinosum*, Milne-Ed. N. unc. on stones and laminarian roots at l.w.-m., Falmouth B. (Cocks)
55. *L. listerianum*, Milne-Ed. N. unc. Falmouth B. on fronds and stem of *Fucus serratus*, *Cystoseira ericoides*, &c. (Cocks)
56. *Polycyclus savignyi*, Herdman. Several specs. of a non-encrusting *Polycyclus* with test of a dark dingy blue in 1901 in 20 fm. Falmouth B., feebly attached to various sea-weeds. They had 8 large and 8 small tentacles, and the terminal bulbs in the test showed up as conspicuous brown dots !
57. *Botryllus smaragdus*, Milne-Ed. N. unc. Selley's beach and Gyllyngvase, Falmouth (Cocks) ; a green *Botryllus* at Polperro, Fowey and Falmouth is probably this species
58. *B. violaceus*, Milne-Ed. C. on rocks, under stones and on weed at l. w. shores of Plymouth district (M.B.A.) ; plentiful Polperro ! and Falmouth ; Sennen Cove, on *Fucus* !
59. *B. schlosseri*, Pallas. On rocks, stones, and sea-weeds in Falmouth B. and Harb. (Cocks)
60. *B. gemmeus*, Sav. In Falmouth Harb. on *Fucus serratus* (Cocks)
61. *Botryllus rubens*, A. & H. N. unc. attached to stones, Falmouth (Cocks)
62. *B. virescens*, A. & H. N. unc. on stones and *Laminaria* about Falmouth (Cocks)
63. *B. bivittatus*, Milne-Ed. On stones and *fuci* about Falmouth (Cocks) ; Falmouth (Alder)
64. *Botrylloides rubrum*, Milne-Ed. C. below stones under the Hoe (M.B.A.) ; Falmouth B. on young fronds of *Fucus serratus*, r. (Cocks) ; c. Falmouth (Alder)
65. *B. rotifera*, Milne-Ed. N. unc. Falmouth B. under stones and on stems of young *Fucus serratus* (Cocks)
66. *B. clavelina*, Giard. Crow S., Scilly, 1903 !
67. *Doliolum nationalis*, Borgert. Plymouth district plentiful in tow-nettings, Aug. and Sept. 1893, and abund. in 1895 ; several specs. S. of the Eddystone Nov. 1904 (M.B.A.)
68. *Salpa fusiformis*, Cuvier. Aggregated form at the surface, north of the Eddystone, Aug. 1901 (M.B.A.)
69. *S. mucronata*, Forskal. Large shoals, Plymouth S. in 1893, from about 15 June to 7 July (M.B.A.)
70. *Oikopleura dioica*, Fol. Gen. present in tow-nettings in Plymouth district, Falmouth B. and Scilly ; occ. abund.
71. *O. flabellum*, J. Müll. Abund. in tow-nettings, Scilly, July, 1903 !
72. *Fritillaria borealis*, H. Lohmann. Plymouth, March, Oct. and Nov. 1899, Eddystone, Aug. 1903 (M.B.A.)

MOLLUSCS

NON-MARINE

Owing to the scarcity of calcareous soils, the paucity of woods and quiet streams and the fouling of many of the rivulets by the waste products of the mines and china-clay works, Cornwall is not a county favourable to the development of terrestrial and fluviatile mollusca.

Still out of a total of 139 species known to occur in the British Islands 82 have been recorded from the duchy. This does not take count of the following species, which have been cited, but seemingly in error, viz. *Punctum pygmæum*, *Buliminus montanus*, *Pupa anglica*, *Vertigo substriata*, *Clausilia biplicata*, *Planorbis marginatus* and *Sphærium lacustre*. Some of these forms, and sundry others, may however yet be found when more thorough search has been made than has hitherto been the case.

The most interesting member of the fauna is *Hygromia revelata*, whose distribution in the British Isles is confined to south Devon, Cornwall, the Scilly and Channel Islands. Like *Helix pisana*, which occurs in west Cornwall, *Hygromia revelata* is a south-western form, and seemingly a survivor of the fauna which inhabited the old lowlands, now submerged, that in Pleistocene times extended along the west coast of Europe down to Portugal. In this connection the recent discovery¹ in the Neolithic burial ground at Harlyn Bay of abundant examples of *Hygromia montivaga* (West.), a species closely allied to *H. revelata*, but now only found living in Spain and Portugal, becomes of the highest interest; and one would not be greatly surprised were living examples of the Irish slug (*Geomalacus maculosus*, Allman), which is itself another survivor of the old lowland fauna, to be discovered some day in one or other of the little wooded valleys around the Cornish coast.

A handsome and striking variety of the big black slug (*Arion ater*) seems common in the county. This instead of being entirely black has a broad yellow stripe along either side, and it has in consequence had the varietal name of *bicolor* bestowed upon it.

The Cornish streams being as a rule both short and rapid the larger freshwater molluscs are nowhere to be met with, save the freshwater pearl mussel (*Unio margaritifera*), which prefers these waters, and which has been taken in the Camel, the Tamar and other streams from the hilly districts. Roughly speaking this species is confined to the area north and west of a line joining Plymouth and Hull. The pearls from

¹ *Proc. Malac. Soc. Lond.* v. 188.

MOLLUSCS

these mussels are sometimes fine, and British pearls in ancient days enjoyed some celebrity ; they even had their attractions for Julius Cæsar.

Papers on the Cornish non-marine molluscan fauna as a whole are not abundant, and deal more with the western than the eastern portion of the duchy. The more important are a series by Mr. T. Cocks in the *Annual Reports of the Royal Cornwall Polytechnic Society* (No. 17, 1849, p. 61 ; No. 24, 1856, p. 20 ; and No. 45, 1877, p. 124), and one by Mr. E. D. Marquand in the *Transactions of the Penzance Natural History and Antiquarian Society* (new ser. 1883-4, i. 403). From these, the Records of the Conchological Society and various scattered sources, the accompanying list has been compiled.

A. GASTROPODA

I. PULMONATA

a. STYLOMMATOPHORA

- Testacella maugei*, Fér. Penzance ; Hayle ; Truro ; Falmouth
 — *baliotidea*, Drap. Newlyn ; Heamoor ; Penzance
Limax maximus, Linn.
 — *flavus*, Linn.
 — *arborum*, Bouch.-Chant.
Agriolimax agrestis (Linn.)
 — *lævis* (Müll.)
Amalia sowerbii (Fér.)
 — *gagates* (Drap.)
Vitrina pellucida (Müll.) Local ; it also occurs in the Scilly Isles
Vitrea crystallina (Müll.)
 — *lucida* (Drap.)
 — *alliararia* (Miller) Also occurs in the Scilly Isles
 — *glabra* (Brit. Auct.)
 — *cellaria* (Müll.) Also occurs in the Scilly Isles
 — *nitidula* (Drap.)
 — *pura* (Ald.)
 — *excavata* (Bean) Land's End
 — *nitida* (Müll.) Trevaylor
 — *fukva* (Müll.) Towans ; Falmouth
Arion ater (Linn.) Plentiful and large ; the variety *bicolor* is common
 — *bortensis*, Fér.
 — *circumscriptus*, John.
 — *subfuscus* (Drap.)
Pyramidula rupestris (Drap.)
 — *rotundata* (Müll.)
Helicella virgata (Da C.)
 — *itala* (Linn.)
 — *caperata* (Mont.)
 — *barbara* (Linn.)
Hygromia fusca (Mont.) Local
 — *granulata* (Ald.) Also occurs in the Scilly Isles

- Hygromia hispida* (Linn.)
 — *revelata* (Fér.) Whitsand Bay ; St. Michael's Mount ; Lizard ; Falmouth ; Newquay ; and in the Scilly Isles
 — *rufescens* (Penn.) Also occurs in the Scilly Isles
Acanthinula aculeata (Müll.) Penzance ; Falmouth ; Truro
Vallonia pulchella (Müll.) Also occurs in the Scilly Isles
Helicigona arbustorum (Linn.) Morvah
Helix aspersa, Müll. } Also occur in the
 — *nemoralis*, Linn. } Scilly Isles
 — *bortensis*, Müll. Newquay
 — *pisana*, Müll. Whitsand Bay ; St. Ives ; Falmouth
Buliminus obscurus (Müll.) Falmouth
Cochlicopa lubrica (Müll.) Also occurs in the Scilly Isles
Azeca tridens (Pult.) Truro
Pupa cylindracea (Da C.) Also occurs in the Scilly Isles
 — *muscorum* (Linn.)
Sphyradium edentulum (Drap.) Local
Vertigo pygmæa (Drap.) Local
Balea perversa (Linn.) Also occurs in the Scilly Isles
Clausilia bidentata (Ström.)
Succinea putris (Linn.) Also occurs in the Scilly Isles
 — *elegans*, Risso.

b. BASOMMATOPHORA

- Carychium minimum*, Müll.
Melampus denticulatus (Mont.) Penzance ; Falmouth
Alexia myosotis (Drap.) Land's End ; Penzance ; Whitsand Bay ; Truro ; Scilly Isles
Lenconia bidentata (Mont.) Land's End ; Mousehole ; Hale ; Scilly Isles
Ancylus fluviatilis, Müll.

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| <p><i>Limnæa pereger</i> (Müll.) Also occurs in the Scilly Isles</p> <p>— <i>palustris</i> (Müll.)</p> <p>— <i>truncatula</i> (Müll.)</p> <p>— <i>glabra</i> (Müll.) Rivulet on hill-top on road to Trevayler through Tremere; Madron Well between Fowey and Love</p> <p><i>Amphipeplea glutinosa</i> (Müll.) Near Falmouth</p> <p><i>Planorbis albus</i>, Müll.</p> <p>— <i>glaber</i>, Jeff. Penzance</p> <p>— <i>nautileus</i> (Linn.)</p> <p>— <i>vortex</i> (Linn.) Scilly Isles</p> | <p><i>Planorbis spirorbis</i>, Müll.</p> <p><i>Physa fontinalis</i> (Linn.) } Falmouth</p> <p>— <i>hypnorum</i> (Linn.) }</p> |
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II. PROSOBRANCHIATA

- Paludestrina ventrosa* (Mont.) Land's End (?); Scilly Isles
- *stagnalis* (Bast.) Hale
- Bithynia tentaculata* (Linn.)
- Vakvata piscinalis* (Müll.)
- Pomatias elegans* (Müll.) Perranporth (rare)
- Acicula lineata* (Drap.) Falmouth
- Neritina fluviatilis* (Linn.) Shell drift, St. Ives Bay

B. PELECYPODA

- | | |
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| <p><i>Unio margaritifer</i> (Linn.) River Camel; River Tamar</p> <p><i>Sphærium corneum</i> (Linn.) Scilly Isles</p> <p><i>Pisidium amnicum</i> (Müll.) Castle Horneck Gate; Falmouth</p> | <p><i>Pisidium pusillum</i> (Gmel.) Crantock; Treve-thow Pond; Scilly Isles</p> <p>— <i>fontinale</i> (Drap.)</p> |
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ADDENDA

Since the foregoing was written and set up in type some important additions have been made to the fauna of the county.

Arion intermedius, Norm., has been found near Land's End; *Vallonia costata*, Müll., now known to be distinct from *V. pulchella*, Müll., has been taken at Truro; *Pisidium milium*, Held. [i.e. *P. gassiesianum*, Dupuy] has been met with near Penzance; and *P. obtusale*, Pfr., recorded from the Swan Pool, Falmouth; whilst from the top soil near Newquay a

single specimen of *Clausilia laminata* (Mont.) has been obtained.

On St. Michael's Mount a shell of *Testacella maugei*, Fér., was picked up. This is not a likely place for it to have been introduced, and in view of the fact that it has lately been found in a holocene rain-wash at Porlock Weir, near Minehead, in a spot too remote from habitation to permit of its presence being accounted for by introduction, this species must now be held to be indigenous to the British Isles.

INSECTS

The geographical position of Cornwall does not appear to have so much influence on its insect population as upon its marine life and its birds. In common with the other southern counties of England, it possesses a number of insects with a very limited range to the north, but neither in wealth of species nor in pride of peculiar possession is it greatly distinguished from the adjoining counties. The width of the Channel no doubt diminishes the number of casual but exciting visitors from the Continent, though at Falmouth, Penzance, and occasionally elsewhere aliens 'of assisted passage' are taken from time to time. There is evidence now and again of immigration on the south coast sometimes on an extended scale, but migratory movements seem to be much more frequent on the Bristol Channel side. At Bude, Mawgan Porth, Hayle, and elsewhere on the north coast a long fringe of black scum has been occasionally observed on the advance water of the inflowing tide or else a crape-like band on the sand at high-water mark, which on examination is found to consist of millions of drowned insects, presumably overtaken by adverse weather when *en route*, or blown out to sea by sudden storm. At Chapel Porth, St. Agnes, and at Mawgan Porth in the vale of Lanherne, an irregular stream of insects has been occasionally observed for hours at a stretch passing steadily out to sea, sometimes in large flocks, sometimes in twos and threes, never showing undignified haste, but rarely loitering much before their departure. When cabbage whites are abundant this emigration stream becomes very conspicuous, and hundreds of thousands of these butterflies must at times in the course of a single afternoon pass out of the county to the north at Chapel Porth. As drowned butterflies have never been reported in quantity along the north coast, it would appear that most of them effect a landing somewhere. There is little direct evidence to show that immigrant swarms come in on the Bristol Channel coast, but the number of waifs and strays from more northern localities, especially among the Lepidoptera, that are from time to time captured in Cornwall, certainly suggests movements of this kind.

The remarkably genial climate of Cornwall might have been expected to favour the presence of a few specially southern insects, particularly round the head of Mount's Bay, but so far as known there are none peculiar to the district, and, indeed, the specially Cornish insects favour the north coast rather than the south, and the most obvious effect of the mild winters is to disturb the rest of hibernating species and hasten the appearance of some that emerge in the early spring.

In some orders, and notably in the Lepidoptera and Coleoptera there is a marked scarcity of insects throughout the county, and the number of species recorded is no index to the density of insect population. In both the orders named a much greater proportion of species than usual is represented by only one or two specimens, and if these casuals were removed from the lists there would be a very considerable shrinkage in their dimensions.

A HISTORY OF CORNWALL

The entomology of Cornwall has not received so much attention as its marine zoology, and several of the sections have been entirely neglected by local observers. The Lepidoptera have naturally attracted many workers, and the late Mr. W. E. Baily of Penzance summed up their observations and his own in the annotated list of 799 county species he published in 1894. This list is excellent so far as it goes, but contains practically no records from the north of the county and almost none from the district between the Bodmin Moors and the Tamar, while the rich collecting district about Liskeard and Looe is scarcely referred to at all. About 600 species of Coleoptera have been recorded from the Penzance and Land's End district, but except for the extreme south-east of the county and the Isles of Scilly the rest of Cornwall, so far as beetles are concerned, has been practically a land unknown. The published lists of county Hymenoptera are almost entirely confined to the Aculeata of the Land's End district and of the north coast, and to a list of 125 Entomophaga from the country around Penzance, but there are occasional references to Ichneumons from other parts of the county. The saw-flies, on the other hand, have been almost wholly neglected. The dragon-flies have received a fair amount of attention, but the only other records of importance for the Neuroptera are some notes by Mr. W. C. Boyd on the occurrence of a few Trichoptera in the west. The county Orthoptera have never received systematic attention, but many valuable data have been preserved. The Diptera are represented by a list of 340 species collected by Messrs. J. C. and C. W. Dale in the west of Cornwall and by a list from Colonel Yerbury of his captures on the Isles of Scilly, together with occasional references in periodical literature. The Hemiptera Heteroptera of West Cornwall were ably dealt with by Mr. Marquand; a few occurrences have been noted from the south coast, and Mr. C. G. Champion has published a list of his captures at Scilly. The Homoptera, however, have received practically no attention. No attempt appears to have been made so far to identify the Aphides, but Mr. E. D. Marquand has published a list of forty-eight Cornish species of that seldom-studied order, the Aptera.

When this article on Cornish Entomology was originally planned, the sections on the Lepidoptera and saw-flies were to have been written by Mr. W. E. Baily, on Entomophaga by the Rev. T. A. Marshall, and on the Coleoptera, Aculeate Hymenoptera, Hemiptera, and Aphides by the present writer, while it was hoped that other local entomologists might be induced to take up the other sections. The death of Mr. Baily and of Mr. Marshall, and the absence of local workers on the less popular sections of entomology, caused the whole of the responsibility for the work to devolve upon the author. Fortunately the Biological Department of the County Technical Schools at Truro is a very large one, and systematic entomology has been taught there for the last six years, so that with the enthusiastic co-operation of a number of his senior pupils the difficulties of the work have been gradually overcome. In addition to the systematic workers on various orders, there has been from year to year a large number of collectors, many of whom have rendered admirable service. The necessity for completing the work somewhat hurriedly has prevented full use being made of all the material collected, and though every species about the identification of which no doubt exists, is given on the following lists, the distribution in the county is not always so com-

INSECTS

pletely described as it might have been had there been more opportunity for collating the material in the different collections.

For the past seven years considerable attention has been given in the Agricultural Department of the Technical School to the injurious pests of the county, and in connexion with the County Council agricultural work, farmers and market-gardeners have been encouraged by gratuitous advice or treatment to report on damage done, and to send in specimens for identification. In each of the orders throughout this article special reference is made to the extent of the injury caused by different species in the county since systematic observations began, but the limited space prevents more than occasional reference to preventative and remedial methods of treatment.

The following table shows at a glance the number of Cornish insects in each order that, so far as the writer is aware, have been identified up to 31 March, 1906. It is more than probable that the numbers given are in some cases slightly understated, as it has been impossible for the author at Truro to gain access to all the monographs on British insects or to ransack all the entomological periodicals for records :—

| | | |
|--|-------|--|
| Aptera | 48 | |
| Orthoptera (including introductions) | 36 | |
| Neuroptera | 222 | |
| Dragon-flies | 24 | |
| Pseudo-neuroptera | 66 | |
| Neuroptera-planipennia | 34 | |
| Trichoptera | 98 | |
| Hymenoptera | 1,012 | |
| Phytophaga | 218 | |
| Entomophaga | 531 | |
| Aculeata, &c. | 263 | |
| Coleoptera | 1,703 | |
| Lepidoptera | 1,113 | |
| Rhopalocera | 48 | |
| Heterocera | 1,065 | |
| Diptera | 722 | |
| Hemiptera | 319 | |
| Heteroptera | 218 | |
| Homoptera | 101 | |
| Aphides | 98 | |
| Total | 5,273 | |

These numbers, of course, are approximately true only up to the date specified, as several of them will be considerably increased when the Lizard peninsula and the north coast receive systematic and continuous attention. Unfortunately, too, our knowledge of the insects of the entire eastern half of the county, except the Whitsand Bay and Plymouth district, is still in a fragmentary condition because of the dearth of resident entomologists. Among the Diptera and the Entomophagous Hymenoptera there must be many hundreds of county specimens waiting identification, and in every order, save the Aptera and the Orthoptera, there is a residue of doubtful and unidentified species, several of which may prove new to the British Isles.

In addition to the help from so many 'brethren of the net' acknowledged in almost every section of the work, the writer wishes to express his great

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indebtedness to Mr. G. C. Bignell, Mr. H. Goss, Mr. J. H. Keys, Mr. C. G. Lamb, Mr. W. J. Lucas, and also to the late Mr. C. G. Barrett, and the late Mr. R. McLachlan for such encouragement, assistance, and advice as only the experienced can give, and without which many of the difficulties might have proved insuperable.

APTERA

In spite of their simplicity of structure and their abundance, the beautiful, active little insect popularly known as 'Spring-tails' have been singularly neglected by entomologists generally. The difficulties in the way of their effective preservation, their minute size, and their remarkably unobtrusive habits are probably in great measure responsible for this unmerited neglect. Moisture and darkness seem to be necessities of life among the many, and their customary habitats are among damp leaves, under wood and stones, and the bark of decaying trees, by streams and ditches, and in one or two instances the surface of water in stagnant pools. Disused flowerpots stored away in a damp shady corner of the garden are a happy hunting-ground for the beginner. In Lord Avebury's monograph on the order, sixty-one British species are described. The Cornish species have been carefully examined by E. D. Marquand, who in the *Transactions of the Penzance Natural History and Antiquarian Society* (new series), vol. i, gives a minute description of forty-eight species, one of which is new to the British Isles. The county species are as follows:—

| | | |
|--------------------------------|--------------------------------|---------------------------------|
| <i>Smynthurus viridis</i> | <i>Beckia argentea</i> | <i>Isotoma grisea</i> |
| — <i>fuscus</i> | <i>Lepidocyrtus curvicolis</i> | <i>Achorutes dubius</i> |
| — <i>aureus</i> | — <i>lignorum</i> | — <i>purpurescens</i> |
| — <i>niger</i> | — <i>violaceus</i> | — <i>murorum</i> |
| <i>Papirius fuscus</i> | — <i>gibbulus</i> | — <i>similatus</i> , Nic. (new) |
| — <i>ornatus</i> | — <i>purpureus</i> | <i>Podura aquatica</i> |
| — <i>nigromaculatus</i> | <i>Degeeria nivalis</i> | — <i>Tullbergii</i> |
| <i>Orchesella cincta</i> | — <i>annulata</i> | <i>Lipura ambulans</i> |
| — <i>villosa</i> | — <i>lanuginosa</i> | — <i>Burmeisteri</i> |
| <i>Tomocerus longicornis</i> | — <i>nicoletii</i> | — <i>finetaria</i> |
| — <i>plumbeus</i> | — <i>cincta</i> | — <i>maritima</i> |
| — <i>niger</i> | <i>Isotoma arborea</i> | <i>Anoura muscorum</i> |
| <i>Templetonia crystallina</i> | — <i>viatica</i> | <i>Campodea staphylinus</i> |
| <i>Seira platani</i> | — <i>viridis</i> | <i>Lepisma saccharina</i> |
| — <i>nigromaculata</i> | — <i>aquatilis</i> | <i>Machilis polypoda</i> |
| — <i>buskii</i> | — <i>anglicana</i> | — <i>maritima</i> |

ORTHOPTERA

Earwigs, Cockroaches, Grasshoppers, and Crickets

With the exception of Dr. Cocks of Falmouth, none of the resident entomologists of the county have paid more than passing attention to this attractive order, and up to the present the literature consists of some notes by Cocks in the *Report of the Royal Cornwall Polytechnic Society* for 1858 and a short paper by C. W. Dale, 'Orthoptera of West Cornwall,' in vol. iii of the *Transactions of the Penzance Natural History and Antiquarian Society* (1890), together with sundry records scattered through various papers and journals. In Burr's valuable little work on the British Orthoptera there are many references to Cornwall formed on these published data. The following notes are based on the records of previous collectors, on the varied material brought in by the students of the Technical Schools during the past seven years, and on notes kindly supplied by fellow-entomologists.

FORFICULARIA

Earwigs

Two specimens of that southern species, *Anisolabis annulipes* (Lucas), probably introduced by some calling vessel, were taken by W. Oliver not far from Falmouth Station in June, 1900. They both possessed nine abdominal segments, and were, therefore, presumably males.

The lesser earwig (*Labia minor*, L.) is locally abundant in summer, flying round heaps of stable manure in the bright sunshine. In 1902 it was plentiful in a recently built stone hedge-bank near Newquay, and in 1904 was common for a few days flying over the flowers in the Victoria Gardens, Truro.

INSECTS

The common earwig (*Forficula auricularia*, L.) is ubiquitous and far too common everywhere. It is a most troublesome pest, as it is omnivorous, and frequently works sore havoc among garden flowers. It varies considerably, especially in the length of the forceps, the most distinct varieties being *media*, which is not uncommon about Truro, Falmouth, and Newquay; *borealis*, which is scarce, but has been taken at Truro and near Bude; and *forcipata*, which occurs at Falmouth and at Tresco, Isles of Scilly. The latter, as pointed out by Parfitt, is generally beaten out of trees and bushes.

Forficula pubescens has been recorded by C. W. Dale (*Entomologist* for 1895, p. 333) from the Isles of Scilly, but Burr suggests that all the British captures recorded as *pubescens* may prove to be *lesnei*, Finot. This latter species is evidently scarce in the county, but single specimens have been taken at Falmouth and at Wadebridge, and it has been reported from Launceston.

BLATTODEA

Cockroaches

Ectobia lapponica has occurred at Fowey, as a fresh but damaged specimen was brought in one day in June, 1903, by a farmer, who said he had seen several.

Ectobia panzeri was first recorded from the county by Stephens. It seems to be very erratic in its appearance, as in 1901 it was not uncommon at Falmouth and at Perranporth, but has not been seen in either locality again. It has been taken at Carbis Bay, at Tresco, Scilly, by J. H. Keys at Tregantle, and by Bignell at Downderry. In 1905 several specimens of the paler-coloured Central Europe form were taken at Fowey. The variety *nigripes* occurs somewhat sparingly about Hayle, and in 1905 was captured at Widemouth Bay, near Bude.

Ectobia livida is evidently rare, as it is represented by a single specimen taken at Falmouth by Mrs. Clark in July, 1899.

Phyllodromia germanica has been occasionally taken in houses near the docks at Falmouth, where it is in all probability an introduction. In May, 1904, a specimen was picked up dead at Malpas.

The common cockroach (*Blatta orientalis*) is a too well-known household pest to require comment. In some dry close sultry days in the summer of 1902 it was frequently taken several hundred yards away from all house shelter.

The large American cockroach (*Periplaneta americana*) was abundant in Saltash about forty years ago, but appears to have died out again. It has been twice sent in from Penzance.

Five examples of the handsome Australian cockroach (*Periplaneta australasiae*) were taken lately by one of the under-gardeners in a greenhouse at Carclew, where it appeared to have temporarily established itself.

A fine specimen of the giant *Rhyparobia maderae* was taken at Falmouth in August, 1900, and is now in the museum of the Royal Institution of Cornwall.

ACRIDIODEA

Grasshoppers and Locusts

Stenobothrus lineatus is usually rare, but has been taken occasionally on the sandhills between Newquay and Perranporth. In July, 1901, ten were captured within half an hour in one particular spot about a hundred yards across, and the short shrill stridulation of several others could be heard around.

Stenobothrus viridulus is usually abundant all over the county in August and September. In 1902 it was remarkably common about Newquay, and several specimens were captured showing the pretty rose-colour variation about the head and elytra. The long drawn-out stridulation, beginning low and gradually rising in pitch, is very characteristic.

Stenobothrus rufipes is scarce and apparently local. It has been taken several times at Newquay, and has occurred near Penzance, Falmouth and at Bishop's Wood, Truro.

Stenobothrus bicolor is very common on open land throughout the county. The attractive green form (*S. mollis*, Sharp.) has been taken near Trebartha.

Stenobothrus elegans has been captured at Gyllyngvase, at Mount's Bay and on Hayle towans, but appears to be scarce.

Stenobothrus parallelus is common on higher meadow-land throughout the county, but its colour, habits, and immature appearance generally cause it to be overlooked by the inexperienced.

Gomphocerus rufens is local, but usually common at Maenporth, near Perranwell, and about Bude.

The dainty-spotted *Gomphocerus maculatus* is widely spread on grassy downs and sand-land all over the county and at Scilly. The colour variation is at times extensive.

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The migratory locust *Pachytylus cinerascens* is a casual wanderer to the county. Probably all the records published under *P. migratorius* are referable to this species. In 1846 a number of locusts belonging to one or both of these species appeared on the east coast of England, and a few stragglers came as far west as Cornwall. In 1857 another wave appeared, and half a dozen at least were taken in the county. In 1876 there were numerous English records, but no captures were reported from the south-western counties at all. Back in the sixties two specimens were taken at St. Mary's, Scilly, and one was captured on St. Agnes in 1897, which lately passed into the writer's possession and is undoubtedly *P. cinerascens*. Examples of the 'migratory locust' were obtained at the Lizard in the early forties the description of which agrees well with the species, and in 1902 an unusually fine female of *P. cinerascens* was taken near Godolphin.

A solitary specimen of *Oedipoda coerulescens* was captured by E. T. Price in the vicinity of Hugh Town, St. Mary's, Scilly, in 1903. The bright blue of its wings had attracted the attention of several of the islanders, who had already made one or two attempts to capture it before Price secured it, and the specimen in consequence was somewhat damaged.

The large North African locust, *Schistocerca peregrina*, visited England in considerable numbers in 1869 and 1870. Bignell says that between 9 and 11 October, 1869, about thirty specimens were taken in and around Plymouth. Three were taken in the autumn of that year at St. Germans, and it was captured at Looe and at Falmouth, while two were taken near Hayle and at least four in the neighbourhood of Newquay. In October of the following year another small flight of this locust visited Cornwall, and several were taken at Falmouth and a number at the Lizard. About that time large locusts were also taken at Bude.

The variable little grasshopper *Tettix bipunctatus* is recorded by Bignell from Pill and Saltash, and seems indeed to be fairly common throughout the county on warm dry slopes covered with short grass and on dry, sheltered, sunny pastures. It is an early insect, but has been found in Cornwall in mature condition in every month of the year.

Tettix subulata, another very variable grasshopper, is also widely spread but apparently local, and even in its favourite haunts about Newquay is much scarcer than the preceding species.

LOCUSTIDAE

Grasshoppers

Leptophyes punctatissima is not uncommon near Boscastle in a broad, overgrown, bramble-covered hedgebank, and is occasionally taken at sugar. Single examples have been taken at Budock, Falmouth, and at Kea, Truro.

A solitary specimen of the pretty *Phaneroptera falcata* from Central France was taken by Mason at Porthgwarra near the Land's End in September, 1881. As McLachlan suggested, it had probably found its way ashore from a passing vessel.

Meconema varium is not uncommon in the east of the county and frequently occurs as far west as Bodmin. About Truro and Falmouth it is decidedly scarce, and has not been reported from the Penzance district at all.

Locusta viridissima is the largest of our indigenous Orthoptera, and is by no means uncommon locally on rough herbage and among coarse-growing herbaceous weeds throughout the county. In some seasons it is plentiful about Truro, Falmouth and Newquay, and in 1902 was unusually common everywhere.

Thamnortrizon cinereus is very local. It is at times fairly common about Falmouth, and in some of the bramble-lanes and nettle-beds there its short, sharp chirp may often be heard far into the night. In 1901 and 1902 it was common about Bishop's Wood, Truro, but is never seen or heard there now. It is often plentiful up the valley of the Gannel, and has been reported from Looe.

Platycleis grisea appears to be confined to a few favoured spots on the south coast. It occurs near the Land's End, is occasionally taken on rest-harrow near Portscatho, and has been reported from Mevagissey. Of the allied species *P. brachypterus* one example has been taken by Tellam near Bodmin and one in the valley of Millook; about thirty years ago several were taken at Falmouth. Germonprez found a very young *Platycleis* larva at Par, which Burr refers doubtfully to the somewhat northern species *P. roesalii*, of which scarcely half a dozen specimens have been found in England.

GRYLLODEA

Crickets

The wood cricket (*Nemobius sylvestris*) has been recorded from Trevaylor, Penzance, but its occurrence there is somewhat improbable and no specimen has been produced.

The field cricket (*Gryllus campestris*) is described as Cornish by Stephens, but no recent specimens have been found and it is probably extinct.

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The house cricket (*Gryllus domesticus*) is fairly common still in bakehouses and old kitchens throughout the county, but is not nearly so plentiful as it was twenty years ago.

The mole cricket (*Gryllotalpa gryllotalpa*) was first recorded from Cornwall by Stephens. It is still found in the county, and one warm spring evening two years ago the writer was delighted to hear the welcome 'churr' of this fine insect only a short distance away from Truro. During the last six years seven specimens have been captured in the county and many more could have been taken but for the fear of exterminating it. The *Gryllotalpa cophta* of de Haan, merely a variety with abbreviated wings, was captured last year (1905) at Marazion.

NEUROPTERA

Psocids, Stone-flies, Dragon-flies, and Lacewings

With the exception of the Dragon-flies, the Neuroptera of Cornwall have received very little attention. Some notes by Mr. W. C. Boyd on his captures in the west of the county in vols. xxxviii and xxxix of the *Entomologist's Monthly Magazine* are apparently the only published records of any extent. The list that follows is based on the work of the writer and his biological pupils from 1900 to 1904, on a small collection formed by the late Mr. W. E. Baily of Penzance, and on data published or furnished by fellow entomologists. It contains 24 Dragon-flies, 66 Pseudo-neuroptera, 34 Neuroptera-Planipennia, and 98 Trichoptera, in all 222 species, and is undoubtedly very incomplete. The arrangement followed in the Dragon-flies is that of Lucas, in the Trichoptera that of McLachlan in his *European Trichoptera*, and in the remainder that of McLachlan and Eaton in their *Catalogue of British Neuroptera*. The author's thanks are due to Mr. W. J. Lucas for much kind assistance. He also wishes to express his great obligation to the late Mr. R. McLachlan, without whose help the article could not have been undertaken.

ODONATA

Dragon-flies

In spite of their evil reputation as suggested by the popular names of 'Horse-stangs' and 'Blood-suckers,' dragon-flies do not possess even the rudiments of a sting, and their jaws are incapable of making any impression on the human skin. Their large size, truculent appearance, and uncanny flight are no doubt responsible for the remarkable prejudice that has everywhere caused them to become objects of dread. It is true they are carnivorous in their habits and possess an almost insatiable appetite for insects, which by their superior power and agility of flight they capture on the wing, but this persistent hawking of insect life is, from an economical point of view, beneficial rather than otherwise, and their ferocity is exhibited only in the facility of capture and promptness of consumption of their prey.

The dragon-flies in Cornwall, as in many other counties, have been unaccountably neglected by resident entomologists. Dr. Cocks paid some attention to them (see *Royal Cornwall Polytechnic Society's Report for 1862*), but the only recent attempt at enumeration is a paper by the late Mr. W. E. Baily, entitled 'Our Common Dragon-flies,' in vol. ii (new series) of the *Transactions of the Penzance Natural History and Antiquarian Society*. Several additional records have been published by Major A. Ficklin and others, and these, with the captures made by the students during the past three years, bring the total for the county up to twenty-four.

The handsome *Sympetrum striolatum* is widely distributed over the county, occurring even on Tresco and St. Mary's, Isles of Scilly, and at least occasionally on Tean. In many localities it is abundant, as in the neighbourhood of Truro, Falmouth, and Penzance, in the valley of the Gannel, and here and there on the Camel. It has been taken every month from June to December, but in cold weather becomes so sluggish that it can be caught with the fingers.

Sympetrum scoticum was first taken near Falmouth in July, 1902. Since that date it has been captured on six occasions in the same locality and, with the exception of a wandering male, all within seventy yards from the spot where the first specimen was obtained. A single specimen has also been reported from the Tamar above Launceston.

A female of *Sympetrum fonscolombii*, presumably the second captured in the British Isles, was taken by W. C. Boyd on 4 June, 1903, at a little village called Sheffield on the road to Trewoofe, near Penzance (*E. M. M.* vol. xxxix, 201).

Libellula depressa is generally distributed over the whole county, and is frequently found at a considerable distance from water. In spite of its wide range it does not seem to be plentiful anywhere, and on account of its wariness is much more frequently seen than caught.

Libellula quadrimaculata is widely distributed but evidently local, and in most years nowhere common. On 20 June, 1901, however, fourteen examples were taken and many more seen near

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Marazion, a locality where it does not seem to have occurred before or since. It is a well-known migratory species, and these may have been recently-arrived aliens from the Continent.

Orithetrum coerulescens is apparently local. It is often common in the Land's End and Penzance district from July to October, is not infrequently captured in College and Trefusis Woods, Falmouth, and in the neighbourhood of Bodmin. It was recorded by Briggs from Bude, and in 1905 was plentiful about a little marsh adjoining a strip of wood in the Millook valley.

That grand dragon-fly *Cordulegaster annulatus* is widely spread, and though somewhat local is often plentiful. It occurs on most of the streams on the east of the county, and on the Gannel, the Fowey, and Truro river. It has been taken by Briggs at Bude and beside the Camel above Wadebridge. At Falmouth it frequents College and occasionally Trefusis Woods, and Baily says that it is abundant everywhere around Penzance throughout the summer, even into late November.

Brachytron pratense, though not common, is pretty generally distributed along the southern half of the county as far west as Falmouth. In the north it has been taken in the vale of Lanherne.

Aeschna juncea is evidently scarce. One was taken by Marquand at Trevalyor, and one by Baily at Paul near Penzance, and the latter states that it has been seen at Marazion, Madron valley, and St. Ives; C. W. Dale also records it from the Penzance district. One was obtained and several have been seen over the reed-beds at Pencalenick, near Truro. It is one of the most difficult insects in the county to capture.

Aeschna cyanea is of frequent occurrence in the east along the middle and lower courses of the streams, and in the quieter country lanes. Along the south it is locally fairly common as far west as Mabe and Constantine. In the north it has been taken near Wadebridge.

Aeschna grandis is rare, but has been taken several times on marshy land near Falmouth, once in the Technical School gardens at Truro, and once in the vale of Lanherne.

The fairy-like *Calopteryx virgo*, with its gentle fluttering flight, is often one of the most attractive features of the wooded streams of the Penzance district during June, July and the early part of August. It is frequently seen near Falmouth, and is at times plentiful about Pencalenick and elsewhere in the neighbourhood of Truro. It is occasionally abundant by the Gannel near Trevemper Bridge, and is reported from the Camel above Wadebridge. It is common about Plymouth and locally so along the bush-fringed streams in the east of the county.

Calopteryx splendens is much more local and not nearly so common as *C. virgo*. It is occasionally plentiful about Launceston, Egloskerry, and Altarnun, has been taken about Calstock and Botus-Fleming, and as far west as Truro river.

Lestes sponsa was fairly common at Trebartha in August, 1902, but does not seem to have been recorded from any other part of the county.

Platynemis pennipes has been taken on the Inney near Lewannick, and has been reported from the Draynes river above Liskeard.

Erythromma najas is not uncommon in the month of June on the moors and marshes of the Land's End and Penzance district. It has been obtained near Constantine, and is occasionally captured in the neighbourhood of Truro. Specimens have also been sent in from near Roche.

Pyrrhosoma nymphula is widely distributed and on the whole common throughout the county. It is one of the earliest dragon-flies to appear, and on 26 April, 1901, was plentiful near Ruan Lanihorn.

Pyrrhosoma tenellum is described by Baily as abundant on all the moors of the Penzance district where marshy spots and stagnant pools abound. In June, 1902, three were taken and many seen by the side of Swanpool, Falmouth.

In 1893 C. W. Dale informed Briggs that *Ischnura pumilio* was common about Penzance, and about that time a presumably local specimen came into the possession of W. E. Baily. Diligent search in 1903 and 1904 failed to discover the haunts of this rare insect.

Ischnura elegans is common and generally distributed in the Land's End and Penzance district; is local about Falmouth and Truro, but of frequent occurrence around Lostwithiel. Stray specimens have been taken in the east of the county, and Norgate records it from Tresco, Isles of Scilly. The female form described by Lucas in which bright orange predominates on the head, thorax, and first two segments of the abdomen, has been taken on the Lynher.

Baily records *Agrion pulchellum* as having been taken sparingly in the Penzance district at Chy-an-hal, Nanscothan, Trengwainton, and Marazion marshes.

Agrion puellae has been taken sparingly in the Penzance district by several collectors. It is reported from the south-east of the county and was taken last year near Millook.

Of *Agrion mercuriale* Mr. W. J. Lucas writes to the author: 'Major A. Ficklin gave me a female from near Land's End. I have never recorded it, as the female is so like that of *A. puella*. I was hoping to see a male later, but Major Ficklin is now dead. Personally I have no doubt about the identification.'

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Enallagma cyathigerum has been obtained by the Inney near Altarnun, on the Allen near St. Tudy, and occurs somewhat sparingly in the neighbourhood of Truro.

PSEUDO-NEUROPTERA

(*Psocids and Stone-flies*)

PSOCIDAE

- Atropos, Leach
- divinatoria, Müll.
- Clothilla, Westw.
- pulsatoria, L.
- picea, Mots.
- Hyperetes, Kolbe
- guestfalicus, Kolbe
- Bertkauia, Kolbe
- prisca, Kolbe
- Psocus, Latr.
- longicornis, Fab.
- nebulosus, Steph. *Bishop's Wood, Truro*
- variegatus, Fab.
- fasciatus, Fab. *Truro*
- sexpunctatus, L. *Truro*
- bifasciatus, Latr.
- quadrimaculatus, Latr. *Falmouth*
- Stenopsocus, Hagen
- immaculatus, Steph.
- cruciatus, L. *Bishop's Wood, Truro*
- Caecilius, Curt.
- pedicularius, L.
- flavidus, Steph. *Falmouth*
- obsoletus, Steph. *Falmouth*
- Dalii, McLach.
- vittatus, Latr.
- perlatus, Kolbe
- picea, Kolbe
- fuscopertus, Latr. *Bishop's Wood, Truro*
- Peripsocus, Hagen
- phaeopterus, Steph. *Launceston*

PSOCIDAE (continued)

- Elipsocus, Hagen
- unipunctatus, Müll.
- cyanops, Rostock
- westwoodii, McLach. *Bishop's Wood, Truro*
- hyalinus, Steph. *Falmouth; Truro*
- flaviceps, Steph. *Liskeard*

PERLIDAE

- Dictyopteryx, Pict.
- microcephala, Pict.
- Perla, Geoff.
- marginata, Panz.
- cephalotes, Curt.
- Chloroperla, Newm.
- grammatica, Poda
- Isopteryx, Pict.
- torrentium, Pict.
- tripunctata, Scop. *River Inney near Altarnun*
- Taeniopteryx, Pict.
- nebulosa, L.
- risi, Morton
- Leuctra, Steph.
- geniculata, Steph.
- hippopus, Kemp. *Valley of the Lynher*
- fusciventris, Steph.
- Nemoura, Latr.
- variegata, Oliv.
- meyeri, Pict.
- cinerea, Oliv.
- sulciollis, Steph.

EPHEMERIDAE

- Ephemera, L.
- vulgata, L.
- danica, Müll.
- lineata, Eaton
- Leptophlebia, Westw.
- marginata, L. *R. Linney*
- submarginata, Steph.
- Habrophlebia, Eaton
- fusca, Curt.
- Caenis, Steph.
- macrura, Steph.
- dimidiata, Steph. *Marhamchurch*
- Ephemerella, Walsh
- ignita, Pod. *Falmouth*
- Baetis, Leach
- binoculatus, L.
- scambus, Eaton
- rhodani, Pict. *Marhamchurch*
- pumilus, Burm. *Falmouth*
- niger, L. *Falmouth*
- vernus, Curt.
- Centroptilum, Eaton
- luteolum, Müll.
- Cloeon, Leach
- dipterum, Linn.
- rufulum, Müll.
- Rhithrogena, L.
- semicolorata, L. *Trebartha*
- Heptagenia, Walsh
- sulphurea, Curt. *R. Linney*
- Ecdyurus, Eaton
- venosus, Fab. *Stratton*
- insignis, Eaton. *R. Linney*
- lateralis, Curt. *R. Fowey*

NEUROPTERA-PLANIPENNIA

(*Lacewings*)

SIALIDAE

- Sialis, Latr.
- lutraria, L.
- fuliginaria, Pict.

RAPHIDIIDAE

- Raphidia, L.
- notata, Fab. *Launceston*

OSMYLIDAE

- Osmylus, Latr.
- chrysops, L. *R. Camel*
- Sosyra, Burm.
- fuscata, Fab.
- terminalis, Curt.

HEMEROBIIDAE

- Micromus, Ramb.
- variegatus, Fab.
- paganus, L.

HEMEROBIIDAE (continued)

- Hemerobius, L.
- elegans, Steph. *R. Camel; Trebartha*
- nitidulus, Fab.
- micans, Oliv. *Launceston; valley of the Lynher*
- lutescens, Fab. *Bude*
- humuli, L.
- marginatus, Steph. *Truro; Falmouth*
- limbatus, Wesm. *Liskeard*
- pini, Steph. *Liskeard*
- atrifrons, McLach. *Liskeard*
- subnebulosus, Steph.

CONIOPTERYGIDAE

- Coniopteryx, Curt.
- tineiformis, Curt.
- psociformis, Curt.
- aleyrodiformis, Steph.

CHRYSOPIDAE

- Chrysopa, Leach
- flava, Scop.
- vittata, Wesm.
- alba, L.
- flavifrons, Brauer. *Launceston*
- vulgaris, Schneider
- septempunctata, Wesm.
- aspersa, Wesm. *Bishop's Wood, Truro*
- ventralis, Curt. *Bishop's Wood, Truro*
- phyllochroma, Wesm. *Liskeard*
- perla, L.
- Nothochrysa, McLach.
- capitata, Fab.

PANORPIDAE

- Panorpa, L.
- communis, L.
- germanica, L.

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TRICHOPTERA

(Caddis Flies)

INAEQUIPALPIA

PHRYGANEIDAE

- Phryganea, L.
- grandis, L.
- striata, L.
- varia, Fab.

LIMNOPHILIDAE

- Colpotaulius, Kol.
- incisus, Curt. *Trebartha*
- Grammotaulius, Kol.
- atomarius, Fab. *R. Lynher*
- Glyphotaelius, Steph.
- pellucidus, Retz.
- Limnophilus, Leach
- rhombicus, L. *Swanpool*
- flavicornis, Fab. *Marhamchurch*
- marmoratus, Curt. *R. Linney*
- xanthodes, McLach. *Newquay*
- lunatus, Curt.
- centralis, Hag. *Altarnun* ; *Flushing* (Boyd)
- vittatus, Fab.
- affinis, Curt. *Millook*
- auricula, Curt. *Truro* ; *Trewoofe* ; *Marazion* (Boyd)
- griseus, L.
- bipunctatus, Curt.
- hirsutus, Pict. *Falmouth* (Boyd)
- luridus, Curt. *R. Lynher*
- sparsus, Curt.
- fuscicornis, Ramb. *Marhamchurch*
- Anabolia, Steph.
- nervosa, Curt.
- Stenophylax, Kol.
- stellatus, Curt.
- latipennis, Curt. *R. Lynher*
- concentricus, Zett.
- vibex, Curt. *R. Lynher*
- Micropterna, Stein.
- sequax, McLach.
- lateralis, Steph.
- Halesus, Steph.
- radiatus, Leach. *Falmouth*
- digitatus, Schrk.
- Drusus, Steph.
- annulatus, Steph. *R. Lynher*
- Chaetopteryx, Steph.
- villosa, Fab. *Trebartha*
- Apatania, McLach.
- muliebris, McLach.

SERICOSTOMATIDAE

- Sericostoma, Latr.
- personatum, Spence
- Notidobia, Steph.
- ciliaris, L.

INAEQUIPALPIA (continued)

SERICOSTOMATIDAE (continued)

- Goera, Leach
- pilosa, Fab.
- Silo, Curt.
- pallipes, Fab.
- nigricornis, Pict. *Marazion*
- Brachycentrus, Curt.
- subnubilus, Curt.
- Crunoecia, McLach.
- irrorata, Curt.
- Lepidostoma, Ramb.
- hirtum, Fab.
- Lasiocephala, Costa
- basalis, Kol.

AEQUIPALPIA

LEPTOCERIDAE

- Molanna, Curt.
- angustata, Curt.
- Odontocerum, Leach
- albicorne, Scop. *R. Lynher*
- Leptocerum, Leach
- nigro-nervosus, Retz.
- albo-guttatus, Hagen. *Launceston*
- annulicornis, Steph.
- aterrimus, De Geer. *Marhamchurch*
- cinereus, Steph. *Truro* ; *Lizard* (Boyd)
- albifrons, L.
- commutatus, McLach. *Truro*
- bilineatus, L.
- dissimilis, Steph.
- Mystacides, Latr.
- nigra, L.
- azurea, L.
- longicornis, L.
- Trienodes, McLach.
- bicolor, Ream.
- conspersa, Ramb. *Truro*
- Adicella, McLach.
- reducta, McLach.
- Oecetis, McLach.
- ochracea, Curt. *Swanpool*
- lacustris, Pict. *Swanpool*
- testacea, Curt.
- Setodes, Ramb.
- tineiformis, Curt.
- interrupta, Fab.

HYDROPSYCHIDAE

- Hydropsyche, Pict.
- pellucidula, Curt.
- angustipennis, Curt.
- guttata, Pict.
- instabilis, Curt. *R. Camel*
- lepida, Pict. *E. Cornwall*

AEQUIPALPIA (continued)

HYDROPSYCHIDAE (continued)

- Diplectrona, Westw.
- felix, McLach.
- Philopotamus, Westw.
- montanus, Donovan
- Wormwaldia, McLach.
- occipitalis, Pict.
- Plectrocnemia, Steph.
- conspersa, Curt. *R. Linney*
- geniculata, McLach. *St. Ives* (Boyd)
- Polycentropus, Curt.
- flavo-maculatus, Pict.
- multiguttatus, Curt.
- Holocentropus, McLach.
- dubius, Ramb. *Loe Pool*
- picicornis, Steph.
- Cylinus, Steph.
- trimaculatus, Curt.
- Ecnomus, McLach.
- tenellus, Ramb.
- Tinodes, Leach
- waeneri, L.
- assimilis, McLach. *Portsmouth* (Boyd)
- Lype, McLach.
- phaeopa, Steph.
- Psychomyia, Latr.
- pusilla, Fab.

RHYACOPHILIDAE

- Chimarra, Leach
- marginata, L. *Launceston*
- Rhyacophila, Pict.
- dorsalis, Curt. *R. Linney*
- oblitterata, McLach. *R. Camel*
- munda, McLach. *R. Lynher*
- Glossosoma, Curt.
- boltoni, Curt.
- vernale, Pict.
- Agapetus, Curt.
- fuscipes, Curt. *Flushing and Penzance* (Boyd) ; *Malpas, Newquay*
- comatus, Pict.
- Beraea, Steph.
- pullata, Curt. *E. Cornwall*
- maurus, Curt. *Falmouth*

HYDROPTILIDAE

- Agraylea, Curt.
- multipunctata, Curt. *Truro*
- Hydroptila, Dalm.
- tineoides, Dalm.
- sparsa, Curt.
- Orthotrichia, Eaton
- angustella, McLach.

INSECTS

HYMENOPTERA

PHYTOPHAGA

Saw-flies and Gall-flies

The Phytophagous Hymenoptera include the saw-flies, and, for convenience, the whole of the gall-flies, though some of the latter are parasites or even hyperparasites on the larvae of the gall-makers. The former derive their name from the characteristic structures possessed by the female, by means of which an incision is made in some plant structure—leaf, twig, tender stem, bark, or solid wood—for the reception of the egg. These ‘saws’ present great variety in their details, so that it is possible to identify most of the British species by these appendages alone. The larvae of the saw-flies are exclusively vegetarian in their diet, but vary greatly in appearance and habit. The majority are leaf-feeders, and many of these closely resemble lepidopterous larvae. Some are leaf-miners, a few are leaf-rollers, and some are gall-makers. *Leptocerus luridiventris* is broad and flat, and lives closely attached to the leaf like some huge scale-insect. *Eriocampoides limacina*, from its appearance and manner of feeding, is almost invariably identified in the nursery and garden as a slug. The burrowers in wood are very similar in outward appearance to the larvae of Coleoptera.

The majority feed up during the summer and autumn and emerge in the spring. Many appear during the summer, and *Emphytus serotinus* is taken regularly at Bishop’s Wood, Truro, in October. Some again are double-brooded, and some, like *Athalia spinarum*, may give rise to three generations in the year.

Saw-flies are for the most part sluggish and quiet, and though common, are rarely seen on the wing. Their flight is weak and heavy, and in dull weather they will remain almost motionless on leaves or flowers for hours at a stretch. *Tenthredo*, *Allantus*, and *Cephus* are common visitors to the Umbelliferae and composites in the Public Gardens at Truro when the weather is bright and warm. In the spring willow-catkins are in favour, and in the late summer Angelica becomes very attractive. In 1901 one of the best hunting-grounds for saw-flies around Truro was an old rhubarb bed that had been allowed to come into flower. A large triangular patch of hogweed near Malpas has been a much-favoured spot for several years.

One of the most remarkable facts connected with the saw-flies is the prevalence of parthenogenesis. In nearly all species the males are very much less numerous than the females, and in many no males have been discovered at all. Extensive observations and experiments on unfertilized eggs obtained from females in confinement show that in most cases the parthenogenetic progeny is entirely composed of females, in a few of males, and occasionally contains both sexes. Cameron is of opinion that parthenogenesis involves constitutional weakness, fewer of the young from unfertilized eggs reaching maturity than from those that are fertilized. Sharp says it appears most probable that the parthenogenesis and the sex of the offspring produced by it are due to physiological conditions of which we know little, and that the species in most cases continue in spite of parthenogenesis rather than profit by it. Several species have, nevertheless, been shown to possess the power of reproducing their like throughout a long series of generations without the intervention of the male, and as Cameron acknowledges that there are over a hundred British saw-flies of which he has never seen the males, there is very strong presumptive evidence that many species must owe their continued existence to parthenogenetic reproduction.

Though saw-flies, as a rule, are not much in evidence, there are several species that at times do considerable injury in the larval stage to farm and garden crops. Of these the gooseberry caterpillar, *Pteronotus ribesii*, is probably the best known, as there are few gardens in the county it has not visited at one time or other. When left unchecked it often completely denudes both gooseberry and currant bushes of their foliage. Fortunately their skin is very susceptible to irritants and poisons generally, so that a dusting of quicklime or of hellebore powder is an excellent remedy. It should be followed, however, by the autumn removal of surface soil from under the bushes.

In May, 1901, some pale yellow larvae with seven pairs of ventral legs were sent in from Bodmin feeding inside young apples. Later on a number of the apples about the size of crabs, with the inside partly consumed, fell from the trees, but the larvae themselves had vanished. An attempt was made to breed out those originally sent, but this proved unsuccessful. They probably belonged to the genus *Hoplocampa*, though no representative of the genus has been captured in that district.

The foliage of the cherry, and occasionally of the plum and apple, suffer from the ravages of the slugworm, *Eriocampoides limacina*; and in 1902 a number of thorns near Truro lost almost all their leaves from such an attack. In 1897, an unusually dry year, some cherry trees at Liskeard were completely stripped of their foliage in less than a week. In 1899 and 1900 pears and apples were badly attacked about St. Columb and at Newquay, and a wall peach at Carworgie suffered severely both years. In 1904 and 1905 the pest appeared in considerable numbers in the Truro-Falmouth district. A liberal application of lime and soot well mixed together and washed off the

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following day has proved an effective remedy. The recurrence of the attack can generally be prevented by removing the surface soil and destroying the enclosed cocoons.

The only recorded attacks of the turnip saw-fly larvae or 'Niggers' (*Athalia spinarum*) during the last ten years have been on young broccoli in the Land's End district in 1899, on turnips near Helston in 1901, and near Bude in 1905. The damage in each case, though severe, was very local.

Though *Cephus pygmaeus* is very common throughout the county, the damage it does to grain crops seems to be trifling, as not a single complaint or sample of injured stem or head has been sent in during the last seven years. A few infested stalks have been noticed in the Grampound district and about Truro, but in no case have they amounted to 1 per cent. of the total crop.

Up to the present about four hundred saw-flies have been recorded from Great Britain, and many of these appear to be extremely local. The following list of 181 species is evidently the first that has been published for Cornwall, and though it represents the work of seven years, is by no means complete. Several of the students have collected largely in different parts of the county, but all the collections made are not now available; and though every species is here recorded that has been identified up to the present, the localities are not so complete as they would have been had a note been kept of the capture of species already represented in the type collection.

The succession of genera is that adopted by Konow.

LIST OF THE PHYTOPHAGOUS HYMENOPTERA OCCURRING IN THE COUNTY

- | | |
|--|--|
| Neurotoma flaviventris, Ratz. <i>Liskeard</i> | Dineura stilata, Klug. <i>E. Cornwall</i> |
| Pamphilus sylvarum, Steph. <i>Truro</i> | — testaceipes, Klug. <i>Falmouth</i> |
| — sylvaticus, L. <i>Newquay</i> | — despecta, Htg. <i>E. Cornwall</i> |
| — inanitus, Vill. <i>Truro</i> | Cryptocampus pentandrae, Cam. <i>R. Lynher</i> |
| — depressus, Schr. | — angusta, Cam. <i>E. Cornwall; Truro</i> |
| — hortorum, Klug. Two specimens taken near <i>Launceston</i> , 18 May, 1904 | — saliceti, Cam. <i>Liskeard</i> |
| Cephus femoratus, Curt. | Pontania xanthogaster, Först. |
| — linearis, Schr. <i>Trebartha</i> | — leucosticta, Htg. |
| — arundinis, Giraud. <i>Pencalenick, Truro</i> | — nigrolineatus, Cam. <i>E. Cornwall</i> |
| — tabidus, Fab. <i>Newquay</i> | — baccarum, Cam. <i>Saltash; Truro</i> |
| — niger, Harris. <i>Newquay</i> | — salicis-cinerea, Retz. <i>R. Lynher</i> |
| — pygmaeus, L. | — bella, Zaddach. Widely distributed |
| Sirex noctilis, Fab. Bred at <i>Saltash</i> from an old fir tree in the summer of 1902 (Bignell) | — gallicola, West. Widely distributed |
| — gigas, scarce but widespread; fairly common, <i>Bodmin</i> | Pteronous bipartitus, Lep. |
| Cimbex sylvarum, Fab. | — pavidus, Lep. <i>Truro</i> |
| — connata, Vell. <i>Mount Edgumbe</i> | — miliaris, Pz. |
| — femorata, L. One specimen taken near <i>Calstock</i> | — curtispinis, Thoms. |
| Trichiosoma vitellinae, L. Near <i>Truro</i> | — melanaspis, Htg. <i>E. Cornwall; Falmouth</i> |
| — lucorum, L. <i>Upper Tamar</i> | — tibialis, Newm. A single specimen captured on the <i>Budock Downs</i> 19 June, 1902 |
| — betuleti, Klug. <i>Lower Lynher</i> | — myosotidis, Fab. <i>E. Cornwall</i> |
| Abia sericea, L. | — ribesii, Scop. |
| — nigricornis, Leach | — melanocephalus, Htg. |
| — fasciata, L. | — salicis, L. |
| Arge coeruleipennis, Thoms. <i>Falmouth</i> | Amauronematus histrio, Lep. <i>Calstock; Truro</i> |
| — ciliaris, L. <i>Falmouth</i> | — haemorrhoidalis, Spin. <i>R. Lynher</i> |
| — fuscipes, Fall. <i>Truro</i> | Croesus septentrionalis, L. |
| — ustulata, L. <i>E. Cornwall</i> | — varus, Vill. <i>Newquay</i> |
| — atrata, Först. <i>E. Cornwall</i> | Holcoccneme lucida, Pz. <i>E. Cornwall</i> |
| — pagana, Pz. <i>Truro</i> | — coeruleocarpa, Hart. <i>Looe valley</i> |
| — rosae, de Geer. <i>Truro</i> | Nematus abdominalis, Pz. By the <i>Lynher</i> in June; <i>Penzance</i> (Baily) |
| — cyanocrocea, Först. | — ruficapillus, Gmel. <i>Penzance district</i> |
| — melanochra, Gmel. <i>Truro; Falmouth</i> | Pachynematus rumicis, Fallen. <i>Truro; Falmouth</i> |
| Lophyrus sertiferus, Fourc. <i>Penzance district</i> | — capreae, Pz. <i>E. Cornwall</i> |
| Cladius pectinicornis, Fourc. <i>E. Cornwall</i> | — obductus, Htg. <i>Lower Lynher</i> |
| Trichiocampus viminalis, Voll. <i>Falmouth</i> | — conductus, Ruthe. <i>Lower Lynher</i> |
| — rufipes, Lep. <i>E. Cornwall</i> | Pristiphora conjugata, Dbm. Two specimens found in a school collection, every insect in which was collected round <i>Truro</i> and <i>Falmouth</i> |
| — ulmi, L. <i>Penzance</i> (Baily) | — pallidiventris, Fallen. Near <i>Newquay</i> |
| — eradiatus, Htg. <i>E. Cornwall</i> | — appendiculata, Htg. <i>Lower Lynher</i> |
| Priophorus padi, L. Widely spread | — fulvipes, Fallen. <i>Falmouth</i> |
| Camponiscus luridiventris, Fallen. Widely spread | — ruficornis, Oliv. |
| Hemichroa alni, L. <i>Bodmin</i> | Phyllotoma nemorata, Fallen. <i>Looe valley; Truro</i> |
| — rufa, Pz. <i>Bodmin</i> | |

INSECTS

LIST OF THE PHYTOPHAGOUS HYMENOPTERA OCCURRING IN THE COUNTY (*continued*)

- Phyllotoma vagans*, Fallen. *Liskeard district*
— microcephala, Klug. *Liskeard district*
Eriocampoides varipes, Klug. *Falmouth*
— annulipes, Klug. *E. Cornwall*
— limacina, Retz. *E. Cornwall; Truro*
— rosae, Harris. *Falmouth*
Hoplocampa pectoralis, Thoms.
— crataegi, Klug. *Truro*
— testudinea, Klug. *Falmouth; Launceston*
Mesoneura verna, Klug. *S.E. Cornwall*
Periclista melanocephala, Fab. *Doublebois*
Pareophora nigripes, Klug. *E. Cornwall*
Ardis sulcata, Cam.
Phymatoceras aterrima, Klug. *Lower Lynher*
Tomostethus fuscipennis, Fallen. *Liskeard district; Falmouth*
— fuliginosus, Schr.
— dubius, Gmel. *Launceston district*
— luteiventris, Klug. A single specimen in a school collection made between *Truro* and *Falmouth*
Blennocampa assimilis, Fallen. *Fowey*
— pusilla, Klug
— subcana, Zadd. One specimen from *Falmouth*
— cinereipes, Htg. *Malpas; Truro*
— alchemillae, Klug. *Truro*
Entodecta pumilio, Klug. A single specimen taken by Marryat at *Looe* in 1890, but not identified till 1903
Monophadnus geniculatus, Htg. *Truro*
— ruficruris, Brullé. *E. Cornwall*
— albipes, Gmel. Common near *Launceston*
Kaliosysphinga melanopoda, Cam. Bred from the leaves of the common alder gathered near *Liskeard*
— pumila, Klug. *Upper Tamar district*
— ulmi, Sundev. Bred from leaves of the common elm gathered in *Tregoll's Road, Truro*
Athalia spinarum, Fab.
— rosae, L.
— lugens, Klug. *Falmouth*
Selandria serva, Fab.
— sixii, Voll. *Swanpool, Falmouth*
— stramineipes, Klug. One specimen from *E. Cornwall*, one from *Bodmin*
— morio, Steph.
Strongylogaster cingulatus, Fab. Females are taken not infrequently in the east and middle of the county, but there is not a single male in any of the Cornish collections
Eriocampa ovata, L.
Poecilosoma pulverata, Retz. *E. Cornwall*
— longicornis, Thoms.
— liturata, Gmel. *Penzance district*
— submutica, Thoms. *Falmouth*
Emphytus togatus, Fab.
— cinctus, L.
— ruficinctus, Retz.
— calceatus, Klug.
— tibialis, Pz.
— serotinus, Klug. *Bishop's Wood, Truro, 14 October, 1902*
— tener, Fallen.
Taxonus agrorum, Fallen. Two specimens, *Trevaylor valley, near Penzance, 1894*
Taxonus equiseti, Fallen.
— glabratus, Fallen.
Dolerus fulviventris, Klug. Near *Truro*
— anticus, Thoms. *Launceston district*
— palustris, Klug. Near *Devoran, 10 June, 1901*
— dubius, Klug. *Falmouth*
— gonager, Fab.
— puncticollis, Thoms. *S.E. Cornwall*
— haematodes, Schr. *Budock Bottom; Falmouth*
— nigratus, Müll. *Lower Lynher*
— niger, Htg.
— aeneus, Htg. *Truro; Falmouth*
Sciopteryx costalis, Klug. *Launceston district*
Loderus palmatus, Klug. Three specimens of *Dolerus*, conspicuous by the white colour on the legs, occur in the Cornish collections from the west of the county. They do not altogether agree with Cameron's description, but in all probability belong to this species.
Rhogogastera viridis, L. Common on hogweed, *Truro*
— punctulata, Klug.
— lateralis, Fab. *Pencalenick; Penryn*
— aucupariae, Klug. *Truro; Liskeard*
Tenthredopsis coqueberti, Klug. *E. Cornwall*
— nassata, L. *Penzance district*
— dorsalis, Lep. *Truro*
Pachyprotasis rapae, L.
— antennata, Klug. *Newquay; Penzance district*
— variegata, Klug. A fine example of this red-legged species was captured by J. J. Lory at *Bishop's Wood, Truro, in 1901*
Macrophya blanda, Fab. *Lower Lynher; Liskeard; Truro; Penzance district*
— neglecta, Klug. *Truro*
— 12-punctata, L. *Milllook*
— albicincta, Schr.
— ribis, Schr. *Liskeard district*
— rustica, L.
— rufipes, L. *Mount Edgcumbe*
— punctum-album, L.
Allantus scrophulariae, L. *Falmouth*
— arcuatus, Steph.
— schaefferi, Klug. A specimen taken in *Trevaylor valley, Penzance*
— maculatus, Fourc.
— bicinctus, L.
— omissus, Först. *S.E. Cornwall*
— temulus, Scop. *Newquay; Milllook (G. L. Allen)*
Tenthredo flava, Scop. Three specimens taken by Pearce at *Mount Edgcumbe*
— rufiventris, Pz. Been taken once near *Trefusis, Falmouth*
— balteata, Klug. Generally distributed
— atra, L. One specimen from near *Looe*
— livida, L. Common around *Gulval* and *Ludgvan* in June, 1901, but has not been seen there since 1902
— ferruginea, Schr.
— solitaria, Scop. Has twice been taken near *Liskeard*
— mesomela, L.

A HISTORY OF CORNWALL

CYNIPIDAE

Gall-flies

Most of the Gall-flies (Cynipidae) lay their eggs in the meristematic tissue of plants, chiefly, however, on the oak, and a secretion apparently from the larva itself causes an exuberant local growth of tissue that results in the formation of a gall. The oak apple, the oak spangle, the marble gall, and the moss-like bedeguar on the rose are familiar examples of such pathological growths. Some of the gall-flies, however, like the members of the genus *Synergus* are inquilines or guest-flies, laying their eggs in the galls formed by the gall-makers either during or subsequent to the growth of the gall. The typical cynipid gall-maker presents the remarkable anomaly of an alternation of generations, the autumn-formed gall producing females only, which by parthogenetic birth give rise to a spring brood of males and females. These last, as a rule, are only about one-third the size of their parent, and are very dissimilar in form of gall and in general appearance from the generation from which they arise. For thirteen species the galls both of the agamic and of the sexual generation have been found in Cornwall, and in the majority of cases the corresponding 'flies,' together with various inquilines and parasites, have been successfully raised. The process with many of the autumn-formed galls is long and tedious, some of them not appearing till the third year.

Even more remarkable than this alternation of generations displayed by many of the species is the apparently complete absence of the male in *Cynips Kollari* and in *Andricus albopunctatus*. So far as can be ascertained, these species are propagated by perpetual parthenogenesis as only the agamic forms are known.

Till five years ago this section of the Hymenoptera had received no attention in the county, but in the autumn of 1900 an appeal to the members of his agricultural class at the Technical Schools, Truro, resulted in a plentiful supply of galls of many kinds being brought in to the writer. To Commander Arthur Rogers, R.N.R., and to Mr. William Borlase, his thanks are specially due for the valuable services these skilled collectors so freely rendered in diligently searching out many of the rarer forms.

The accompanying list of Cynipidae contains in all thirty-seven species. Where both broods of those that exhibit alternation of generations are known from actual observation to occur in the county, the specific names by which the two generations are still distinguished are bracketed together, the agamic generation in each case taking precedence :—

| | | |
|--------------------------------|---------------------------|------------------------------|
| Rhodites eglanteriae, Htg. | { Andricus globuli, Htg. | Cynips Kollari, Htg. |
| — rosae, L. | { — inflator, Htg. | { Trigonaspis renum, Gir. |
| — spinosissimae, Gir. | { — radialis, Htg. | { — megaptera, Pz. |
| Aulax glechomae, Htg. | { — trilineatus, Htg. | { Biorhiza terminalis, Fabr. |
| — hypochaeridis, Kieffer | { — sieboldi, Htg. | { — aptera, Fabr. |
| Xestophanes potentillae, Vill. | { — testaceipes, Htg. | Dryophanta folii, L. |
| Periclistus caninae, Htg. | — corticis, L. | — divisa, Htg. |
| — Brandti, Ratz. | { — collaris, Htg. | — longiventris, Htg. |
| Synergus melanopus, Htg. | { — curvator, Htg. | { Neuroterus lenticularis, |
| — rheinhardi, Mayr | { — autumnalis, L. | { Oliv. |
| — radiatus, Mayr | { — ramuli, L. | { — baccarum, L. |
| — fascialis, Htg. | — quadrilineatus, Htg. | { — fumipennis, Htg. |
| — thaumacera, Dal. | { — callidoma, Gir. | { — tricolor, Htg. |
| — nervosus, Htg. | { — cirratus, Adler | { — laeviusculus, Schr. |
| Diastrophus rubi, Htg. | — glandulae, Schenck | { — albipes, Schr. |
| Andricus ostreus, Gir. | — solitarius, Fonsc. | { — numismatis, Oliv. |
| { — fecundatrix, Htg. | — albopunctatus, Schlecht | { — vesicatrix, Schlecht |
| { — pilosus, Adler | | |

ENTOMOPHAGA

Ichneumons and their Allies

The Ichneumon flies and their allies constitute Nature's most powerful check on the excessive increase of our insect population. Insects derive their sustenance very largely from the vegetable kingdom, and the destruction of all vegetation through the undue multiplication of phytophagous larvae like the Lepidoptera would be an ever-present danger but for the singular habits of this great family, every member of which is a parasite, dwelling in most cases in the body of a larval host, appropriating the nutriment the latter digests, and ultimately causing its death. The female ichneumons, as a rule, insert their eggs into the bodies of the selected larvae, and the resulting legless maggots during their development lie motionless in the dorsal half of their host, and either

INSECTS

emerge to form a cocoon or remain in the pupa-case of their victim to await their final transformation. In the case of the larger ichneumons only a single egg is deposited in each larva attacked, but with the smaller forms the number may be considerable. Bignell, for instance, has hatched 180 braconids out of a single larva of *Arctia caja*, and 1200 *Microgaster* have been bred out of another Lepidopterous caterpillar.

Though a few ichneumons are apparently limited to a single host, the majority have a fairly extended choice. Morley mentions that the common Cryptid, *Hemiteles areator*, has been bred from eighteen different Lepidoptera, including Bombyces, Tortrices, and Tinea!

Lepidoptera are the best known, but by no means the only victims. Many of the Tryphoninae are parasitic on saw-fly larvae, though the Schizodontes for the most part affect Diptera. The Pimplinae prey largely on the larvae of Coleoptera and Aculeate Hymenoptera, and several of the species attack spiders. An entire section of the Braconids, the *Aphidiidae*, devote themselves exclusively to Aphides, and a large number of still smaller forms finds sufficient material for the growth and development of one or more individuals inside the egg of another insect.

Just as there are insects that prey upon insects, so there are parasites that prey on parasites. These hyperparasites are very numerous, and act as an effective check on the too rapid increase of the parasitic ichneumons and the consequent excessive destruction of lepidopterous and other phytophagous larvae. In such species the parent insect lays her egg in the body of a parasitic larva already ensconced within a vegetable-feeding caterpillar, and this egg develops and attains maturity at the ultimate expense of the two enclosing hosts. The extensive Ophionid genus *Mesochorus* is entirely composed of hyperparasites, and they are well represented in many other groups.

Ichneumons as a rule are extraordinarily agile in their movements and swift and sudden in their flight. During the summer they are abundant almost everywhere throughout the county, and are often taken in considerable numbers at expanding foliage in spring. Many species are fond of plant honey, and may be taken in quantity at nectar-producing flowers. As in the case of the saw-flies, umbelliferae generally possess a powerful attraction for ichneumons, and clumps of angelica, hogweed, and rough chervil are excellent collecting stations when the weather is bright.

The only published list of Cornish Entomophaga is one of 125 species by Mr. E. D. Marquand in a paper 'The Ichneumonidae of the Land's End District' in vol. i (new series) of the *Transactions of the Penzance Natural History and Antiquarian Society* (1880-4). In his 'Fauna of Plymouth; Ichneumonidae,' in the *Transactions of the Plymouth Institute*, 1881-6, Mr. G. C. Bignell includes some Cornish captures, and there are many references to records from the county in Mr. C. E. Morley's recently-published *British Ichneumons*.

Most of the species on the accompanying list have been taken, and a few bred by the students at the County Technical Schools, Truro, where on account of its supreme importance to agriculture and horticulture the sub-order is being made a subject of special study. The diffuse character of the literature on British Ichneumons and their allies has made the work of identification very difficult, and the fragmentary character of many parts of the accompanying list is due far more to this cause than to the lack of material. Several of the sections have not so far been studied at all. As no dubious species has been allowed on the list these sections are not represented.

The writer wishes to acknowledge his indebtedness to Mr. G. C. Bignell for genial assistance so kindly given, and also to the late Rev. T. A. Marshall of Botus-Fleming, by whom it had been fondly hoped this article would have been written.

ICHNEUMONIDAE

LISTRODROMIDES

Listrodromus, Wesm.
— *nyctemerus*, Grav.

JOPPIDES

Hoplismenus, Grav.
— *pernicius*, Grav.
Automalus, Wesm.
— *alboguttatus*, Grav.
Trogus, Panz.
— *lutorius*, Fab.
— *exaltatorius*, Panz.
Protichneumon, Thoms.
— *fuscus*, Linn.

JOPPIDES (continued)

Protichneumon fuscipennis, Wesm.
— *disparis*, Poda.
— *laminatorius*, Fab.
Coelichneumon, Thoms.
— *sugillatorius*, Linn.
— *fuscipes*, Gmel.
— *periscelis*, Wesm.
— *leucocerus*, Grav.
— *comitator*, Linn.
— *bilineatus*, Grav.
— *consimilis*, Wesm.
— *lineator*, Fab.
— *ruficauda*, Wesm.
— *castaneiventris*, Grav.

ICHNEUMONIDES

OXYPTGINI

Stenichneumon, Thoms.
— *culpator*, Schr.
— *pistorius*, Grav.
— *trilineatus*, Gmel.
— *ochropis*, Gmel.
Cratichneumon, Thoms.
— *sicarius*, Grav.
— *rufifrons*, Grav.
— *nigritarius*, Grav.
— *fabricator*, Fab.
— *annulator*, Fab.
— *fugitivus*, Grav.

A HISTORY OF CORNWALL

ICHNEUMONIDES (continued)

OXYPYGINI (continued)

- Cratichneumon coruscator, Linn.
 — albilarvatus, Grav.
 — lanius, Grav.
 — varipes, Grav.
 Eupalamus, Wesm.
 — oscillator, Wesm.
 Melanichneumon, Thoms.
 — leucomelas, Gmel.
 — dumeticola, Grav.
 — saturatorius, Linn.
 — perscrutator, Wesm.
 — Faunus, Grav.
 Barichneumon, Thoms.
 — anator, Fab.
 — vacillatorius, Grav.
 — semirufus, Grav.
 — pulchellatus, Bridg.
 — albicinctus, Grav.
 — derogator, Wesm.
 — bilunulatus, Grav.
 — vestigator, Wesm.
 — chionomus, Wesm.
 Ichneumon, Linn.
 — lugens, Grav.
 — deliratorius, Linn.
 — xanthorius, Först.
 — sarcitorius, Linn.
 — multipictus, Grav.
 — latrator, Fab.
 — subquadratus, Thoms.
 — molitorius, Grav.
 — melanotis, Holmgr.
 — languidus, Wesm.
 — terminatorius, Grav.
 — stramentarius, Grav.
 — computatorius, Müll.
 — albicollis, Wesm.
 — extensorius, Linn.
 — gracilentus, Wesm.
 — confusorius, Grav.
 — tempestivus, Holmgr.
 — bisignatus, Gr.
 — gracilicornis, Grav.
 — quaesitorius, Linn.
 — caloscelis, Wesm.
 — cessator, Müll.
 Exephanes, Wesm.
 — hilaris, Grav.
 — occupator, Grav.
 Chasmius, Ashm.
 — motatorius, Fab.
 — paludicola, Wesm.

AMBLYPYGINI

- Hypomecus, Wesm.
 — quadriannulatus, Grav.
 Ctenichneumon, Thoms.
 — castigator, Fab.
 — Panzeri, Wesm.
 — funereus, Fourc.
 — fossorius, Grav.
 — melanocastanus, Grav.
 — messorius, Grav.
 — divisorius, Grav.
 Spilichneumon, Thoms.

ICHNEUMONIDES (continued)

AMBLYPYGINI (continued)

- Spilichneumon occisorius, Fab.
 — Gravenhorsti, Wesm.
 Amblyteles, Wesm.
 — palliatorius, Grav.
 — litigosus, Wesm.
 — crispatorius, Linn.
 — quadripunctorius, Müll.
 — glaucatorius, Fab.
 — vadatorius, Illig.
 — negatorius, Fab.
 — subsericans, Grav.
 — armatorius, Först.
 — infractorius, Panz.
 — oratorius, Fab.
 — uniguttatus, Grav.
 Hepiopelmus, Wesm.
 — variegatorius, Panz.
 — leucostigmus, Grav.
 Probolus, Wesm.
 — alticola, Grav.

PLATYURINI

- Eurylabus, Wesm.
 — dirus, Wesm.
 — torvus, Wesm.
 — tristis, Grav.
 Platylabus, Wesm.
 — nigrocyanus, Grav.
 — rufus, Wesm.
 — pedatorius, Fab.
 — albinus, Grav.
 — orbitalis, Grav.
 — diciptens, Wesm. Reported by
 C. Perkins from *Godolphin*
 — dimidiatus, Grav.

PHAEOGENIDES

HERESIARCHINI

- Stenodontus, Berth.
 — marginellus, Grav.

PHAEOGENINI

- Herpestomus, Wesm.
 — brunnicornis, Grav.
 Phaeogenes, Wesm.
 — argutus, Wesm.
 — semivulpinus, Grav.
 — planifrons, Wesm.
 — melanogonus, Gmel.
 — ophthalmicus, Wesm.
 — fuscicornis, Wesm.
 — trepidus, Wesm.
 — ischiomelinus, Grav.
 — bellicornis, Wesm.
 Phaeogenes maculicornis, Steph.
 — stimulator, Grav.
 — callopus, Wesm.
 — fulvitaris, Wesm.
 Diadromus, Wesm.
 — troglodytes, Grav.
 — varicolor, Wesm.
 — collaris, Grav.

PHAEOGENIDES (continued)

PHAEOGENINI (continued)

- Oiorhinus, Wesm.
 — pallidipalpis, Wesm.
 Aethecerus, Wesm.
 — longulus, Wesm.
 — nitidus, Wesm.
 — dispar, Wesm.
 Dicaelotus, Wesm.
 — pumilus, Grav.
 — rufilimbatus, Grav.
 — parvulus, Grav.
 Colpognathus, Wesm.
 — celerator, Grav.
 — divisus, Thoms.
 — jucundus, Wesm.
 Centeterus, Wesm.
 — confector, Grav.
 — opprimator, Grav.
 Ischnus, Grav.
 — nigricollis, Wesm.

ALOMYIDES

- Alomyia, Panz.
 — debellator, Fab.

CRYPTIDES

- Stilpnus, Grav.
 — gagates, Gr.
 — transfuga, Gr.
 — pavoniae, Scop.
 Phygadeuon, Grav.
 — dumetorum, Gr.
 — variabilis, Gr.
 — fumator, Gr.
 — galactinus, Gr.
 — troglodytes, Gr.
 — jejunator, Gr.
 — aereus, Gr.
 — nitidus, Gr.
 — vagans, Gr.
 — brachyurus, Thom.
 — semipolitus, Tasch.
 — vagabundus, Gr.
 — cinctorius, Fabr.
 — graminicola, Gr.
 — abominator, Gr.
 — jucundus, Gr.
 — aridens, Gr.
 — nycthemerus, Gr.
 — larvatus, Gr.
 — plagiator, Gr.
 — graminicola, Gr.
 Cryptus, Fabr.
 — tarsoleucus, Schr.
 — moschator, Fabr.
 — anatorius, Gr.
 — titillator, Gr.
 — albatorius, Vill.
 — diana, Gr.
 — arrogans, Gr.
 — hostilis, Gr.
 — obscurus, Gr.
 — analis, Gr.
 — alternator, Gr.
 — peregrinator, L.
 — migrator, Fabr.

INSECTS

CRYPTIDES (continued)

Cryptus cimbicis, Tschck.
 — *pygoleucus*, Gr.
 — *signatorius*, Fabr.
Mesostenus, Grav.
 — *obnoxius*, Gr.
Nematopodius, Grav.
 — *ater*, Brischke
Hemiteles, Grav.
 — *tenebricosus*, Gr.
 — *micator*, Gr.
 — *oxyphimus*, Gr.
 — *crassicornis*, Gr.
 — *similis*, Gr.
 — *fulvipes*, Gr.
 — *dicipiens*, Gr.
 — *formosus*, Desv.
 — *incisus*, Bridg.
 — *bicolorinus*, Gr.
 — *conformis*, Gr.
 — *aestivalis*, Gr.
 — *areator*, Pz.
 — *inimicus*, Gr.
 — *floriculator*, Gr.
 — *tenerrimus*, Gr.
 — *dissimilis*, Gr.
 — *cingulator*, Gr.
 — *furcatus*, Gr.
 — *scrupulosus*, Gr.
Orthopelma, Tasch.
 — *luteolator*, Gr.
Stibeutes, Först.
 — *heinemanni*, Först.
Cremnodes, Först.
 — *atricapillus*, Gr.
Aptesis, Först.
 — *nigrocincta*, Gr.
 — *hemiptera*, Fabr.
 — *brachyptera*, Pz.
Theroscopus, Först.
 — *esenbeckii*, Gr.
Hemimachus, Ratz.
 — *rufocinctus*, Gr.
 — *fasciatus*, Fabr.
 — *annulicornis*, Marsh.
Pezomachus, Grav.
 — *tener*, Gr.
 — *procursorius*, Först.
 — *nigricornis*, Först.
 — *agilis*, Först.
 — *transfuga*, Först.
 — *faunus*, Först.
 — *incertus*, Först.
 — *distinctus*, Först.
 — *micropterus*, Gr.
 — *insolens*, Först.
 — *tristis*, Först.
 — *vagans*, Oliv.
 — *xylochopilus*, Först.

OPHIONIDES

Henicospilus, Steph.
 — *merdarius*, Gr.
 — *ramidulus*, Lin.
Ophion, Fabr.
 — *obscurum*, Fabr.
 — *luteum*, Lin.
 — *minutum*, Kriech.

OPHIONIDES (continued)

Ophion distans, Thom.
Schizoloma, Wesm.
 — *amicita*, Fabr.
Anomalon, Jurine
 — *xanthopus*, Schr.
 — *ruficorne*, Gr.
 — *bellicosum*, Wesm.
 — *cerinops*, Gr.
 — *clandestinum*, Gr.
Agrypon, Först.
 — *flaveolatum*, Gr.
 — *tenuicorne*, Gr.
Trichomma, Wesm.
 — *enecator*, Rossi.
Paniscus, Schr.
 — *cephalotes*, Holmgr.
 — *testaceus*, Gr.
 — *fuscicornis*, Holmgr.
Absyrtus, Holmgr.
 — *luteus*, Holmgr.
Campoplex, Grav.
 — *mixtus*, Gr.
 — *ebeninus*, Gr.
 — *carinifrons*, Gr.
 — *eurynotus*, Först.
 — *oxyacanthae*, Boie.
 — *falcator*, Thunb.
 — *erythrogaster*, Först.
 — *confusus*, Först.
 — *juvenilis*, Gr.
Casinaria, Holmgr.
 — *vidua*, Gr.
Limneria, Holmgr.
 — *alternans*, Gr.
 — *argentata*, Gr.
 — *brevicornis*, Gr.
 — *borealis*, Holmgr.
 — *chrysosticta*, Gr.
 — *concinna*, Holmgr.
 — *crassicornis*, Gr.
 — *curvicauda*, Gr.
 — *cursitans*, Holmgr.
 — *difformis*, Gmel.
 — *dispar*, Gr.
 — *ensator*, Gr.
 — *erucator*, Zett.
 — *exareolata*, Ratz.
 — *exigua*, Gr.
 — *faunus*, Gr.
 — *fenestralis*, Holmgr.
 — *fulviventris*, Gmel.
 — *geniculata*, Gr.
 — *gracilis*, Gr.
 — *insidiator*, Gr.
 — *interrupta*, Holmgr.
 — *longipes*, Müll.
 — *majalis*, Gr.
 — *moesta*, Gr.
 — *mutabilis*, Holmgr.
 — *notata*, Gr.
 — *pagana*, Holmgr.
 — *rapax*, Gr.
 — *rufipes*, Gr.
 — *ruficincta*, Gr.
 — *sericea*, Gr.
 — *transfuga*, Gr.
 — *vestigialis*, Ratz.
 — *volubilis*, Holmgr.

OPHIONIDES (continued)

Limneria vulgaris, Tschck.
Cremastus, Grav.
 — *interruptor*, Gr.
 — *infirmis*, Gr.
Atractodes, Grav.
 — *vestalis*, Hal.
 — *bicolor*, Gr.
 — *pivicornis*, Gr.
 — *fumatus*, Hal.
 — *citator*, Hal.
Exolytus, Holmgr.
 — *laevigatus*, Gr.
Mesochorus, Grav.
 — *confusus*, Holmgr.
 — *gracilentus*, Brischke
 — *fuscicornis*, Brischke
 — *aciculatus*, Bridg.
 — *temporalis*, Thom.
 — *fulgurans*, Hal.
 — *sylvarum*, Hal.
 — *olerum*, Curt.
 — *anomalus*, Holmgr.
Dicolus, Först.
 — *insectator*, Först.
 — *pectoralis*, Först.
Porizon, Fallen
 — *minator*, Gr.
 — *erythrostomus*, Gr.
Thersilochus, Holmgr.
 — *triangularis*, Gr.
Collyria, Schiödte.
 — *calcitrator*, Gr.
Exetastes, Grav.
 — *osculatorius*, Fabr.
 — *nigripes*, Gr.
 — *albitarsus*, Gr.
Banchus, Fabr.
 — *variegator*, Fabr.
 — *pictus*, Fabr.
 — *falcator*, Fabr.
 — *moniliatus*, Gr.

TRYPHONIDES

Mesoleptus, Grav.
 — *testaceus*, Fabr.
 — *laevigatus*, Gr.
 — *paludicola*, Gr.
 — *ventralis*, Curt.
 — *sternoleucus*, Gr.
Cataglyphus, Holmgr.
 — *fuscicornis*, Gmel.
Euryproctus, Holmgr.
 — *atomator*, Gr.
Perilissus, Holmgr.
 — *praerogator*, Gr.
Mesoleius, Holmgr.
 — *ruficornis*, Gr.
 — *aulicus*, Gr.
 — *caligatus*, Gr.
 — *sanguinicollis*, Gr.
 — *alacer*, Gr.
 — *niger*, Gr.
 — *insolens*, Gr.
 — *lateralis*, Gr.
Tryphon, Fallen
 — *rutilator*, L.
 — *trochanteratus*, Holmgr.

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TRYPHONIDES (*continued*)

Eumesius, Westw.
— albitarsus, Curt.
Polyblastus, Hart
— varitarsus, Gr.
— annulicornis, Geraud
Acrotomus, Holmgr.
— lucidulus, Gr.
Cteniscus, Hal.
— gnathoxanthus, Gr.
— succinctus, Gr.
Colpotrochia, Holmgr.
— elegantula, Schr.
Exochus, Grav.
— flavomarginatus, Holmgr.
— curator, Fabr.
— alpinus, Zett.
Bassus, Fabr.
— laetatorius, Fabr.
— scabriculus, Holmgr.
— nemoralis, Holmgr.
— cinctus, Gr.
— flavolineatus, Gr.
— pictus, Gr.
— fissorius, Gr.
— nigratarsus, Gr.
— areolatus, Gr.
— pulchellus, Holmgr.
— cognatus, Holmgr.
— dorsalis, Holmgr.
— festivus, Fabr.
— gracilentus, Holmgr.
— obscuripes, Holmgr.

TRYPHONIDES (*continued*)

Metopius, Pz.
— dentatus, Fabr. Bred by Davies,
St. Issey
— dissectorius, Pz.
— micratorius, Fabr.

PIMPLIDES

Rhyssa, Grav.
— persuasoria, L.
Ephialtes, Grav.
— imperator, Kriechb.
— rex, Kriechb.
Perithous, Holmgr.
— mediator, Fabr.
— divinator, Rossi.
Pimpla, Fabr.
— instigator, Fabr.
— examiner, Fabr.
— pomorum, Ratz.
— turionellae, L.
— rufata, Gmel.
— flavonotata, Holmgr.
— scanica, Vill.
— oculatoria, Fabr.
— graminellae, Schr.
— stercorator, Fabr.
— brevicornis, Gr.
— nucum, Ratz.
Polysphincta, Grav.
— varipes, Gr.
— tuberosa, Gr.
Clistopyga, Grav.
— incitator, Fabr.

TRYPHONIDES (*continued*)

PIMPLIDES (*continued*)

Glypta, Grav.
— teres, Gr.
— monoceros, Gr.
— ceratites, Gr.
— scalaris, Gr.
— bifoveolata, Gr.
Lycorina, Holmgr.
— triangulifera, Holmgr.
Schizopyga, Grav.
— circulator, Pz.
Lampronota, Hal.
— caligata, Gr.
Lissonota, Grav.
— variabilis, Gr.
— anomala, Holmgr.
— parallela, Gr.
— lineata, Gr.
— decimator, Gr.
— bellator, Gr.
— cylindrator, Vill.
— insignata, Gr.
— commixta, Holmgr.
— rufomedia, Bridg.
— sulphurifera, Gr.
Meniscus, Schiödte.
— setosus, Fourc.
— murinus, Gr.
Phytodiaetus, Grav.
— segmentator, Gr.
— coryphaeus, Gr.
Oedimopsis, Grav.
— scabriculus, Gr.

BRACONIDAE

Bracon, Fabr.
— erythroctictus, Marshall
— fulvipes, Nees.
— longicollis, Wesm.
— variegator, Nees.
— nigratus, Wesm.
— stabilis, Wesm.
— erraticus, Wesm.
— laevigatus, Ratz.
— mediator, Nees.
— fuscicoxis, Wesm.
— tornator, Marshall
— satanas, Wesm.
— epitriptus, Marshall
— praetermissus, Marshall
— discoideus, Wesm.
— regularis, Wesm.
— variator, Nees. *Marazion*
— anthracinus, Nees.
Phanomeris, Först.
— fragilis, Hal.
Rhyssalus, Hal.
— clavator, Hal.
— indagator, Hal.
Colastes, Hal.
— hariolator, Hal.
— braconius, Hal.
Oncophanes, Först.
— lanceolator, Nees.
Spathius, Nees.
— exarator, L.

Chremylus, L.
— rubiginosus, Nees.
Hormius, Nees.
— moniliatus, Nees.
Clinocentrus, Hal.
— excubitor, Hal.
Rhogas, Nees.
— bicolor, Spin.
Sigalphus, Latr.
— caudatus, Nees.
— floricola, Wesm.
Chelonus, Jurine
— inanitus, L.
— corvulus, Marsh.
— parvicornis, Schöff.
Ascogaster instabilis, Wesm.
— rufipes, Latr.
— rufidens, Wesm.
Mirax, Hal.
— spartii, Hal.
Acoelius, Hal.
— subfasciatus, Hal.
Apanteles, Först.
— solitarius, Ratz.
— ruficrus, Hal.
— ordinarius, Ratz.
— congestus, Ratz.
— analis, Nees.
— glomeratus, L.
— sericeus, Nees.
— spurius, Wesm.

Apanteles jucundus, Marshall
— caiae, Bouché.
— difficilis, Nees.
— cultrator, Marshall
— xanthostigmus, Hal.
— albipennis, Nees.
— impurus, Nees.
— immunis, Hal.
— popularis, Hal.
— pallidipes, Reinh.
— bicolor, Nees.
— lateralis, Hal.
— fulvipes, Hal.
Microplitis, Först.
— ocellatae, Bouché.
— tuberculifera, Wesm.
Microgaster, Latr.
— alvearius, Fabr.
— subcompletus, Nees.
— tibialis, Nees.
Neoneurus, Hal.
— Halidaii, Marshall
Agathis, Latr.
— anglica, Marshall
Earinus, Wesm.
— gloriatorius, Pz.
Orgilus, Hal.
— obscurator, Nees.
Euphorus, Nees.
— pallidipes, Curt.
— apicalis, Curt.

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BRACONIDAE (*continued*)

Perilitus, Nees.
— *aethiops*, Nees. *Hayle*
Microctonus, Wesm.
— *cultus*, Marshall
Meteorus, Hal.
— *albiditarsus*, Curt.
— *ictericus*, Nees.
— *pallidipes*, Wesm.
— *punctiventris*, Ruthe.
— *albicornis*, Ruthe.
— *abdominator*, Nees.
— *pulchricornis*, Wesm.
— *scutellator*, Nees.
— *leviventris*, Wesm.
— *fragilis*, Wesm.
Eubadizon, Nees.
— *extensor*, L.
Blacus, Nees.
— *tuberculatus*, Wesm.
— *tripudians*, Hal.
— *trivialis*, Hal.
Liophron, Nees.
— *ater*, Nees.
— *litratus*, Hal.

Centistes, Hal.
— *lucidator*, Nees.
— *fuscipes*, Nees.
Macrocentrus, Curt.
— *abdominalis*, Fab.
— *thoracicus*, Nees.
— *infirmis*, Nees.
— *collaris*, Spin.
Zelee, Curt.
— *testaceator*, Curt.
Diospilus, Hal.
— *oleraceus*, Hal.
Dolops, Marsh.
— *hastifer*, Marsh.
— *aculeator*, Marsh.
Opinus, Wesm.
— *spretus*, Hal.
Parvulus, Wesm.
— *rufipes*, Wesm.
Biosteres, Först.
— *carbonarius*, Nees.
Diachasma, Först.
— *cephalotes*, Wesm.

FLEXILIVENTRES

Praon, Hal.
— *longicorne*, Marsh.
— *volucre*, Hal.
Ephredus, Hal.
— *validus*, Hal.
— *lacertosus*, Hal.
Aphidius, Nees.
— *urticae*, Hal.
— *rosae*, Hal.
— *avenae*, Hal.
— *ervi*, Hal.
— *sonchi*, Marsh.
— *ribis*, Hal.
— *cirsii*, Hal.
— *cardui*, Marsh.
— *salicis*, Hal.
— *brassicae*, Marsh.
— *lychnidis*, Marsh.

EVANIIDAE

Foenus, Fabr.
— *assectator*, L.

CHRYSIDIDAE

HYMENOPTERA TUBULIFERA

Ruby-Wasps

Though these beautiful flies with their brilliant metallic colours are by no means rare, they do not seem to have been collected by any entomologist in the county. This may be due to their occupying a sort of 'no man's land' between the Aculeata and the Ichneumons, and partly because there has been till lately no easily accessible account of the British species. The females lay their eggs singly in the cells of a particular bee or wasp just after the latter has stored the nutriment required for her own offspring, and deposited her own egg in the space prepared. The Chrysid larva matures at the expense of the rightful owner, which is invariably destroyed.

Out of the twenty-five species recognized for the British Isles, nine have been obtained in the county up to the present. *Hedychridium minutum* has been obtained at Whitsand Bay, Gerran's Bay, Maenporth and Newquay, and two were taken on St. Martin's, Scilly, in July, 1903. *H. roseum* has twice been found at Looe and once at Perranporth. *Chrysis neglecta* was obtained by Thomas near Lostwithiel, and has been sent in from Penzance. *C. viridula* has been recorded by Bignell from Rame, and has been taken several times at Whitsand Bay. Specimens were received last year from Gerran's Bay and from Newquay. *C. cyanea* occurred about Malpas in 1903, and single examples have been obtained from Falmouth, St. Ives and Bude. *C. succincta* is represented in the Schools' collection by one specimen from St. Ives and two from the Looe valley. *C. ruddii* was taken by Bignell at Millook, and has been captured at Newquay and reported from Looe. *C. pustulosa* was also recorded by Bignell from Millook, and was not uncommon there in July, 1905. *C. ignita* is usually common, and appears to be generally distributed. This beautiful 'Firetail fly' was plentiful along the Leets at Truro in 1900 and 1901, and several small groups were at times observed clustering round the opening of the burrows made by an *Odynerus* in the mortar of a stone wall on the far side of the water.

ACULEATA

Wasps, Bees, Ants, etc.

The ants, wasps, and bees of West Cornwall received considerable attention from Mr. E. D. Marquand, who published a descriptive account of Land's End Aculeata in the *Transactions of the Penzance Natural History and Antiquarian Society* (new ser.) vol. i, and a supplement in vol. iii. Mr. G. A. J. Rothney has made several visits to the north coast of Cornwall, and recorded his captures in the *Entomologist's Monthly Magazine*, vols. xxiv-xxxiv. In vol. xxxviii, Mr. E. B. Nevinson published a list of Aculeata Hymenoptera taken at Newquay. Various other visiting entomologists have collected them from time to time, and the more important of the older records are mentioned in Saunders's *British Hymenoptera Aculeata*. For the last five years Mr. Edwin C. H. Davies, of St. Issey, has assiduously collected these somewhat neglected insects throughout his district, and as all his captures have been identified by Saunders, the annotated list he has kindly sent the writer is

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of exceptional value. During 1901 and 1902 several of the Truro students made collections of the Cornish wasps and bees in different parts of the county, and did much to extend our knowledge of their occurrence and distribution. In spite, however, of willing helpers at the schools and elsewhere, the following list is in all probability very imperfect, and the north coast will have to be much more systematically and continuously examined before any claim can be made that the Cornish list of Hymenoptera Aculeata is even approximately complete.

Sixteen species of ants, representing eleven genera, are found in the county. Two of these, namely, *Monomorium pharaonis* and *Cremastogaster scutellaris* are introductions. The former, in spite of its minute size, is a troublesome pest on provisions in several houses at Falmouth. The latter has been found in greenhouses at Penryn. Among the indigenous ants the commonest of course are *Formica rufa*, with its great mound-like nests; the subterranean *Formica fusca*, which in Bishop's Wood, near Truro, occasionally deserts the ground and takes possession of the stump and roots of cut-down trees; *Lasius fuliginosus*, with its nests in decaying timber; *Lasius flavus*, nesting under stones; the aphid-loving *Lasius niger*, with its extensive subterranean galleries; and the several races grouped together as *Myrmica rubra*. *Lasius umbratus* appears to be scarce, and has so far been found only near Fowey. *Tapinoma erraticum*, a carnivorous ant that, according to Forel, attends the fights between other ants as an interested spectator, and when permitted drags off the body of the vanquished to serve as food, occurs near Land's End, and was found by Dale at Scilly. Several stray examples of the rare *Ponera contracta* have been taken on two different occasions in dry moss at Mount Edgcumbe; *Myrmecina latreillei* was obtained by Dale at Hurst Castle, Fowey; and last year a small colony was found in the same locality. *Tetramorium caespitum* is not uncommon round the coast, occurring at Boscastle, Newquay, on the cliffs near Tol-pedn-penwith, and with its inquiline *Loxotropos tritoma*, on the sea-slope at Downderry. *Stenamma westwoodi* was found some years ago at Mount Edgcumbe, and in 1900 several were obtained in a nest of *Formica rufa* in Bishop's Wood, Truro. A solitary worker of *Leptothorax acervorum* was found at Sandplace, near Looe, in August, 1901.

The Fossores are represented in the county by eighty-three species belonging to twenty-six genera. The apterous female of *Mutilla europaea* was twice taken near the mouth of the Looe valley about twenty years ago, one was obtained at Calstock a few years later, and it has been taken thrice during the past six years at Bishop's Wood, Truro. The winged male was found in the valley of the Gannel, near Trevemper bridge, in the summer of 1903. *Methoca ichneumonides* with its curious ant-like female, is a rare and usually a local insect. In Cornwall, though scarce, it is widely spread. It occurs along the bank of the Lynher in the company of *Myrmosa melanocephala*, has lately been taken near Crackington Haven, and also at Newquay and Perranporth. One male was taken near Truro in 1904, and twenty years ago Marquand captured two on Trevaylor Heath, near the Land's End. Both species of *Tiphia* have been taken sparingly throughout the county, but in spite of an increased number of collectors not one has been recorded for the last five years. *Pompilus bicolor* was obtained by Baily from the neighbourhood of Penzance, and by Rothney in June, 1902, at Newquay. *P. cinctellus* was remarkably common in 1891 round Carbis Bay, but though still found in the county at Newquay and elsewhere, has for some years completely deserted the St. Ives district. *P. consobrinus* was one of Marquand's captures in the Land's End district, and has once been taken since in the neighbourhood of Gulval. *P. unguicularis* occurs in the valley of the Gannel, near Newquay, and has been taken several times in the vicinity of Truro. *Salix affinis* has been obtained by Bignell at Whitsand Bay, has been captured twice near Truro, and is found not unfrequently along the north coast from Newquay to Crackington. *S. notatulus* was taken near Looe in 1900, and again in 1904. *Agenia hircana* has been several times mentioned as a Cornish species, and examples occur in an old reputedly Cornish collection at Falmouth, but without any details as to their origin. The fortunate capture of a female near Bude in July, 1905, however, puts its claims as a county species beyond dispute. *Trypoxylon attenuatum* is occasionally common in favoured spots in the east of the county, but is irregular in its appearance. In 1902 it was plentiful, in 1903 not a single specimen was recorded, in 1904 it was scarce, and in 1905 again common. *Spilomena troglodytes* was first recorded by Marshall from Botus Fleming, and has subsequently been taken at least thrice between the Bodmin Moors and the Tamar. Its small size may cause it to be overlooked by the inexperienced. *Gorytes tumidus* has been obtained occasionally along the south coast from Mount Edgcumbe to Land's End. *G. campestris* has been reported from Calstock, but the two specimens were accidentally destroyed before their identification was corroborated. *G. bicinctus* has been captured near Cargreen, and several times in the Land's End district. *Nysson interruptus* has been found by Bignell near Liskeard. A silvery-looking bee was noticed last year several days in succession near the same spot on the towans at Perranporth, and on capture proved to be the rare *Oxybelus mucronatus*. This species has also been taken by Nevins at Holywell Bay.

The extensive genus *Crabro* is well represented in the county. *C. tibialis* occurs near Trebartha; *C. cetratus* has been taken on the Lynher, and in favourable years *C. capitosus*, though

INSECTS

never common, is widely distributed. *C. palmipes* is common locally, especially on the north coast. Baily obtained several specimens of *C. anxius* from Godolphin. *C. dimidiatus* is not uncommon in the east of the county, but does not appear to have been found west of Liskeard. *C. interruptus* has occurred at St. Germans and in the Looe valley.

The Diptera or true wasps are divided into two sections, the social and the solitary. Of the former Cornwall possesses six out of the seven British species, and of the latter eleven representatives occur in the county. An example of the social genus *Polistes* was captured at Penzance in 1866, and recorded by F. Smith in the *Ent. Ann.* for 1868 (p. 87). As suggested by him, it was probably imported. No further appearances have been recorded for the British Isles.

Among the social wasps *Vespa crabro*, the hornet, is now chiefly confined to the larger woods in the east, but sixty years ago seems to have been common about Falmouth and Penzance. *V. norvegica* is common locally along the southern half of the county from the Tamar to Ponsanooth.

The rarer county species of the solitary wasps include *Odynerus pictus*, which is common at Penzance, has been taken by Nevinson at Newquay, and in 1902 was plentiful about Falmouth, and occasionally seen at Truro; *O. trimarginatus* found on the Isles of Scilly, about the Land's End peninsula, at Newquay, and sparingly at Falmouth; *O. trifasciatus* in the neighbourhood of Penzance. Baily obtained a female *O. parietinus* from Ludgvan, in which the tibiae were of a dusky brown throughout except at the base, where they were tawny. *O. antilope* has been taken at Botus-Fleming, at Whitsand Bay east by Bignell, and several times about Falmouth. Marquand described it as quite abundant in the neighbourhood of Penzance, burrowing in clay walls with a south-east aspect, and in 1902 it was still common. *O. gracilis* is occasionally taken in the Penzance district, and has twice been captured near Helston. A solitary female of *O. sinuatus* was obtained near Calstock in June, 1903.

Of the Anthophilæ or Bees 134 species and six varieties have been obtained in the county up to the present. All the larger genera are well represented with the exception of *Specodes*, a group of little black and red bees of uncertain position but of peculiar interest, as they are either beginning the parasitic habit or giving it up. Of the sixteen British species of this genus only four have been captured in the county.

Colletes fodiens was taken by Ralfs at St. Loy Cove, Burian. There is a large colony in the valley of the Gannel, near Newquay. Another near Ruan Lanihorne was unfortunately destroyed in 1901. Several of the straight cylindrical burrows lined with hardened slime like goldbeater's skin were in this last case obtained quite entire. The three that were opened contained five, seven, and nine cells respectively. From the three that were kept throughout the winter eighteen bees emerged in the month of June. *Colletes picistigma* was recorded by S. S. Saunders from Falmouth, and has been obtained lately by Rothney at Tintagel, by Nevinson at Newquay, and by Davies at St. Issey. A very large colony of a *Colletes* which may have been this species was destroyed a few years ago when the foundations of some new houses were being prepared at Perranporth. *C. marginata* is scarce, but has been reported occasionally from the south coast. A small colony existed for some years near Gerrans, but apparently died out in 1903, as, in spite of careful searching, not a single specimen has been captured there or a burrow found for the last two seasons. This species has been taken lately by Nevinson at Newquay. *Prosopis confusa* is sparingly distributed over the south and west of the county. In August, 1900, eight were taken at bramble flowers one sunny afternoon on the road between Hayle and St. Erth. *Halictus xanthopus* was taken many years ago at the Lizard by C. W. Dale. In 1896 two females and a male were obtained by Baily from Godolphin, and a female by Thomas, in 1900, from Manaccan, so that though scarce, it seems to be distributed over the Lizard peninsula. It has also been taken around Falmouth and at Heligan near Mevagissey. *H. zonulus* is described by Saunders as occurring as far west as Ilfracombe, but it has been obtained occasionally both at Bude and Newquay, and was reported from Falmouth in 1904, but without a voucher specimen. *H. laevigatus* was among Dale's captures at the Land's End, and was taken in 1902 at Enys, near Penryn. In the museum of the Royal Institution are two dilapidated females labelled 'Tresco, Isles of Scilly.' The attractive ashy-grey *H. sexnotatus* occurs round Penzance in most years, and has been taken near Bishop's Wood, Truro, and reported from Looe. *H. malachurus* is mentioned in several local lists, but all the specimens so far submitted are small females of *H. cylindricus*, which is locally an abundant species. *H. pauxillus* has never been recorded from the county, but a single female occurs among several *H. nitidiusculus* marked 'local' in the museum at Launceston. *H. punctatissimus* has been obtained occasionally on Trevaylor Heath, near Penzance, where it was first found by Marquand. *H. minutus* was fairly common near Calstock in 1901 and 1902, but, like several other rare Hymenoptera, disappeared in 1903, and has not been captured since.

The genus *Andrena* is represented in the county by thirty-three species and at least two varieties. *A. pilipes* was taken by Dale at the Lizard and by Marquand at water-mint, near Pengersic Castle, Penzance. From 1899 to 1904 it was common near Falmouth, but last year could not be found. It occurs on the north coast between Tintagel and Boscastle, and there is a large colony on the top of Porth Island, Newquay. *A. bimaculata* was obtained at willow-catkins, near Godolphin,

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by Baily in 1893. It has since been recorded from Loe Pool in the same neighbourhood, and by Nevinson from Perranporth. Of the two varieties of *A. rosae*, *trimmerana* is generally distributed, and not uncommon about the beginning of May, but *spinigera* is evidently local. The autumn brood (*rosae*) occurs not infrequently along the south coast. The *A. austriaca* of Panzer was described by Marquand as plentiful in two or three places at bramble around Penzance, though males were extremely scarce. *A. florea* and *A. thoracica*, though scarce, appear to be generally distributed. The latter has been taken at St. Mary's, Scilly. *A. cineraria* occurs very sparingly about Falmouth and Penzance, and has been taken twice above Scawswater, Truro. *A. clarkella* is nowhere common, but is widely spread. It is one of the earliest spring bees, and has been obtained by Baily on the slopes above Marazion on 12 February. A specimen of *A. nigriceps* was taken by Marquand at *Fasione montana*, near Mulfra, in the Land's End district. Three were taken subsequently near Helston, and Nevinson has found it lately at Newquay. In July, 1883, Marquand captured both sexes of *A. simillima* at their burrows in a hedgebank near Redruth. The species has been taken around Penzance, chiefly at bramble, and also at Perranporth. *A. denticulata* is wide-spread, and in places fairly common. *A. battoriana*, the finest species in the genus, occurs regularly every year about Trevaylor and elsewhere in the Penzance district. It has been taken at Loe Pool, at Falmouth, at Bishop's Wood, Truro, and along the banks of the Lynher. The ruddy form of the female has been obtained once, namely, near Madron, in 1893. *A. cetii*, for a few days at the end of August last year (1905), was common on Scabiosa, near Bude. Previous to that time only two solitary specimens had been recorded for the county. Females of *A. coitana* are not uncommon locally on brambles and wild thyme in the latter half of July, but males are very rare. *A. fulvago* occurs at intervals all round the coast, and has been taken at Tresco, Isles of Scilly. *A. humilis* in the end of June and beginning of July is in places one of the commonest of bees, often burrowing in hard pathways and thronging the heads of mouse-ear hawkweed. On 3 July, 1891, the incoming tide in a perfectly calm sea at Hayle Towans threw up on the sands a long line of black surface scum, which, on examination, was found to be composed of many thousands of dead bees, all belonging to this species. The rare *A. proxima* is represented by a solitary female in beautiful condition, captured by Marquand at Gulval on 7 July, 1883. That recent addition to the British list, *Gilissa melanura*, was taken by E. C. H. Davies at Porthcothan in August, 1903.

The handsome *Dasygaster birtipes* has been taken at intervals along the south coast, but is commoner on the towans of the north. In 1891 there was a splendid colony at Carbis Bay, which was probably destroyed by the sea, as in 1899, when the spot was revisited, it had disappeared. Specimens are still not infrequently captured in the neighbourhood. The present head quarters of this species in the county is in the valley of the Gannel at Newquay.

The coal-black genus *Panurgus* contains only two British species, *P. calcaratus* and *P. ursinus*. The latter is at times one of the most abundant bees in the Land's End district, especially in the month of July. It is not unfrequently reported from other parts of the county, and in 1905 was very common near Bude for about a fortnight. The former is, on the other hand, curiously local though widely spread.

That fascinating genus of inquilines, *Nomada*, contributes seventeen species to the county list. A solitary specimen of *N. obtusifrons* was captured by Marquand on *Fasione montana* near Penzance. *N. sexfasciata* occurs at Mousehole and Newlyn, but is not so common in the Land's End district as its host *Eumenes longicornis*. *N. lathburiana* has been taken occasionally on the banks of the lower Lynher. A male of the fine *N. armata* was obtained by Marquand at Gulval in 1883, and a second specimen ten years later by Baily at Mousehole. *N. ferruginata* and *N. fabriciana* seem to be widely diffused throughout the county, but while the former is somewhat scarce the latter is often abundant in the west and common locally in the north. The diminutive dark brown *N. furva* is generally common, and one sunny day in July, 1905, the number present in the valley leading down to Chapel Porth must, on a modest computation, have amounted to several thousands. Two days later only a few stragglers were left.

The little shining blue bee *Ceratina cyanea* was twice obtained by Marryat at Looe in 1890, but has not been met with since. *Coeloxys vectis* has been taken several times at Trevaylor, near Penzance, and during the past four years has not been uncommon at Newquay. *C. acuminata* is frequently obtained on the north coast between St. Agnes and Tintagel. Several specimens of *Osmia pilicornis* were taken at Scawswater, near Truro, in 1901, and one was captured at Penryn last year. *O. aurulenta* was reported from Liskeard in 1899, and two years later it was bred from shells of *Helix aspersa* from the same neighbourhood. Lately it has been obtained several times at Newquay. A solitary male of *O. leucomelana* was captured at Whitsand Bay east in May, 1904. *Stelis aterrima* is not uncommon about Porthgwarra and at Newquay, and has been taken at Falmouth, at Bishop's Wood, Truro, and near Bude. *S. phaeoptera* occurs around Penzance and on the banks of the Lynher. *Anthophora quadrimaculata* has been taken occasionally about Pendennis Castle, Falmouth, in the neighbourhood of Penryn, and at Newquay, where it shows a most marked partiality for *Lamium purpureum*.

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Among the true bumble bees a female of *Bombus smithianus* has been recorded by Colonel Yerbury from Scilly, a remarkable locality for an Orcadian and Hebridean species with very circumscribed distribution. *B. latrielleus* is by no means rare on the mainland, and the var. *distinguendus* has been taken by Bignell at Mount Edgumbe.

ACULEATE HYMENOPTERA

HETEROGYNA

FORMICIDAE

Formica, L.
— *rufa*, L.
— *fusca*, Latr.
Lasius, Fabr.
— *fuliginosus*, Latr.
— *umbratus*, Nyl.
— *niger*, L.
— — *race alienus*, Först.
— *flavus*, De Geer
Tapinoma, Först.
— *erraticum*, Latr.

PONERIDAE

Ponera, Latr.
— *contracta*, Latr.

MYRMICIDAE

Myrmecina, Curt.
— *latreillei*, Curt.
Tetramorium, Mayr.
— *caespitum*, L.
Stenamma, Westw.
— *Westwoodi*, Westw.
Leptothorax, Mayr.
— *acervorum*, Fabr.
— *tuberum*, Fabr.
Myrmica, Latr.
— *rubra*, L.
— — *race sulcinodis*, Nyl.
— — *race laevinodis*, Nyl.
— — *race ruginodis*, Nyl.
— — *race scabrinodis*, Nyl.
Monomorium pharaonis, L.
Crematogaster scutellaris, Oliv.

FOSSORES

MUTILLIDAE

Mutilla, L.
— *europaea*, L.
Myrmosa, Latr.
— *melanocephala*, Fabr.
Methoca, Latr.
— *ichneumonides*, Fabr.

TIPHIDAE

Tiphia, Fabr.
— *femorata*, Fabr.
— *minuta*, V. de Lind.

SAPYRIDAE

Sapyga, Latr.
— *quinque-punctata*, Fabr.
— *clavicornis*, L.

POMPILIDAE

Pompilus, Fabr.
— *bicolor*, Lep.
— *rufipes*, L.
— *cinctellus*, Spin.
— *plumbeus*, Fabr.

FOSSORES (*continued*)

POMPILIDAE (*continued*)

Pompilus niger, Fabr.
— *approximatus*, Smith
— *viaticus*, L.
— *consobrinus*, Dahlb.
— *spissus*, Schiödte
— *chalybeatus*, Schiödte
— *gibbus*, Fabr.
— *ungicularis*, Thoms.
— *pectinipes*, V. de Lind.
Salius, Fabr.
— *fuscus*, L.
— *affinis*, V. de Lind.
— *exaltatus*, Fabr.
— *notatulus*, Saund.
— *pusillus*, Schiödte
— *parvulus*, Dahlb.
Calicurgus, Lep.
— *hyalinatus*, Fabr.
Agania, Schiödte
— *hircana*, Fab.
Ceropales, Latr.
— *maculata*, Fabr.

SPHEGIDAE

Astatus, Latr.
— *boops*, Schr.
Tachytes, Pz.
— *pectinipes*, L.
Trypoxylon, Latr.
— *figulus*, L.
— *clavicerum*, Lep.
— *attenuatum*, Smith
Ammophila, Kirb.
— *sabulosa*, L.
— *campestris*, Latr.
Spilomena, Shuck.
— *troglodytes*, V. de Lind.
Pemphredon, Latr.
— *lugubris*, Latr.
— *shuckardi*, Moraw.
— *wesmaeli*, Moraw.
— *morio*, V. de Lind.
— *lethifer*, Shuck.
Diodontus, Curt.
— *minutus*, Fabr.
— *luperus*, Shuck.
— *tristis*, V. de Lind.
Passaloecus, Shuck.
— *corniger*, Shuck.
— *insignis*, V. de Lind.
— *gracilis*, V. de Lind.
Psen, Latr.
— *pallipes*, Pz.
Gorytes, Latr.
— *tumidus*, Pz.
— *mystaceus*, L.
— *bicinctus*, Rossi.
Nysson, Latr.
— *interrupta*, Fabr.
— *dimidiatus*, Jur.

FOSSORES (*continued*)

SPHEGIDAE (*continued*)

Mellinus, Fabr.
— *arvensis*, L.
Cerceris, Latr.
— *ornata*, Schaeff.
— *arenaria*, L.
— *interrupta*, Pz.
— *labiata*, Fabr.
Oxybelus, Latr.
— *uniglumis*, L.
— *mucronatus*, Fabr.
Crabro, Fabr.
— *tibialis*, Fabr.
— *clavipes*, L.
— *leucostomus*, L.
— *cetratus*, Shuck.
— *capitosus*, Shuck.
— *podagricus*, V. de Lind.
— *palmipes*, L.
— *varius*, Lep.
— *anxius*, Westw.
— *wesmaeli*, V. de Lind.
— *elongatulus*, V. de Lind.
— *quadrifasciatus*, Dahlb.
— *dimidiatus*, Fabr.
— *vagabundus*, Pz.
— *cephalotes*, Pz.
— *chrysostomus*, Lep.
— *vagus*, L.
— *cribrarius*, L.
— *peltarius*, Schreb.
— *interruptus*, De G.
— *albilabris*, Fabr.
Entomognathus, Dahlb.
— *brevis*, V. de Lind.

DIPLOPTERA

VESPIDAE

Vespa, L.
— *crabro*, L.
— *vulgaris*, L.
— *germanica*, Fabr.
— *rufa*, L.
— *sylvestris*, Scop.
— *norvegica*, Fabr.

EUMENIDAE

Odynerus, Latr.
— *spinipes*, L.
— *callosus*, Thoms.
— *parietum*, L.
— *pictus*, Curt.
— *trimarginatus*, Zett.
— *trifasciatus*, Oliv.
— *parietinus*, L.
— *antilope*, Pz.
— *gracilis*, Brullé.
— *sinuatus*, Fabr.
Eumenes longicornis, L.

A HISTORY OF CORNWALL

ANTHOPHILA ORTUSILINGUES

COLLETIDAE

- Colletes, Latr.
- succincta, L.
- fodiens, Kirb.
- picistigma, Thoms.
- marginata, Smith
- daviesana, Smith
- Prosopis, Fabr.
- communis, Nyl.
- hyalinata, Smith
- confusa, Nyl.
- brevicornis, Nyl.

ACUTILINGUES

ANDRENIDAE

- Sphecodes, Latr.
- gibbus, L.
- subquadratus, Smith
- pilifrons, Thoms.
- similis, Wesm.
- Halictus, Latr.
- rubicundus, Christ
- xanthopus, Kirb.
- leucozonius, Schrank.
- zonulus, Smith
- quadrinotatus, Kirb.
- laevigatus, Kirb.
- sexnotatus, Kirb.
- cylindricus, Fabr.
- albipes, Kirb.
- subfasciatus, Nyl.
- villosulus, Kirb.
- punctatissimus, Schenck
- nitidiusculus, Kirb.
- minutus, Kirb.
- minutissimus, Kirb.
- tumulorum, L.
- smeathmanellus, Kirb.
- morio, Fabr.
- leucopus, Kirb.
- Andrena, Fabr.
- albicans, Kirb.
- pilipes, Fabr.
- tibialis, Kirb.
- bimaculata, Kirb.
- rosae, Pz.
- — v. trimmerana, Kirb.
- — v. spinigera, Kirb.
- flora, Fabr.
- thoracica, Fabr.
- nitida, Fourc.
- cineraria, L.
- fulva, Schr.
- clarkella, Kirb.
- nigroaenea, Kirb.

ACUTILINGUES (continued)

ANDRENIDAE (continued)

- Andrena gwynana, Kirb.
- angustior, Kirb.
- varians, Rossi
- nigriceps, Kirb.
- simillima, Smith
- denticulata, Kirb.
- fulvicrus, Kirb.
- hattorfiana, Fabr.
- cetii, Schr.
- cingulata, Fabr.
- albicrus, Kirb.
- coitana, Kirb.
- fulvago, Christ.
- humilis, Imhoff.
- labialis, Kirb.
- minutula, Kirb.
- nana, Kirb.
- proxima, Kirb.
- dorsata, Kirb.
- wilkella, Kirb.
- afzeliella, Kirb.
- Cilissa, Leach
- haemorrhoidalis, Fabr.
- leporina, Pz.
- melanura, Nyl.
- Dasypoda, Latr.
- hirtipes, Latr.
- Panurgus, Pz.
- calcaratus, Scop.
- ursinus, Gmel.
- Nomada, Fabr.
- obtusifrons, Nyl.
- solidaginis, Pz.
- sexfasciata, Pz.
- succincta, Pz.
- lineola, Pz.
- alternata, Kirb.
- jacobaeae, Pz.
- lathburyana, Kirb.
- ruficornis, L.
- bifida, Thoms.
- ochrostoma, Kirb.
- armata, H. Schff.
- ferruginata, Kirb.
- Nomada fabriciana, L.
- flavoguttata, Kirb.
- furva, Pz.

APIDAE

- Epeolus, Latr.
- productus, Thoms.
- rufipes, Thoms.
- Ceratina, Latr.
- cyanea, Kirb.
- Chelostoma, Latr.
- florissomne, L.
- campanularum, Kirb.

ACUTILINGUES (continued)

APIDAE (continued)

- Coelioxys, Latr.
- vectis, Curt.
- rufescens, Lep.
- elongata, Lep.
- acuminata, Nyl.
- Megachile, Latr.
- maritima, Kirb.
- willoughbiella, Kirb.
- circumcincta, Lep.
- centuncularis, L.
- argentata, Fabr.
- Osmia, Pz.
- rufa, L.
- pilicornis, Smith
- caerulea, L.
- fulviventris, Pz.
- aurulenta, Pz.
- leucomelana, Kirb.
- Stelis, Pz.
- aterrima, Pz.
- phaeoptera, Kirb.
- Anthidium, Fabr.
- manicatum, L.
- Eucera, Scop.
- longicornis, L.
- Melecta, Latr.
- luctuosa, Scop.
- armata, Pz.
- Anthophora, Latr.
- pilipes, Fabr.
- furcata, Pz.
- quadri-maculata, Pz.
- Saropoda, Latr.
- bimaculata, Pz.
- Psithyrus, Lep.
- rupestris, Fabr.
- vestalis, Fourc.
- barbutellus, Kirb.
- campestris, Pz.
- quadricolor, Lep.
- Bombus, Latr.
- Smithianus, White
- venustus, Smith
- agrorum, Fabr.
- hortorum, L.
- — v. harrisellus, Kirb.
- latreilleus, Kirb.
- — v. distinguendus, Mor.
- sylvarum, L.
- derhamellus, Kirb.
- lapidarius, L.
- jonellus, Kirb.
- pratorum, L.
- terrestris, L.
- — v. lucorum, Smith
- — v. virginalis, Kirb.
- Apis, L.
- mellifica, L.

COLEOPTERA

Beetles

The beetles of Cornwall have not received the attention that might have been expected in a county where so much attention has been given to natural history for more than sixty years. Though splendid work has been done by Mr. J. J. Walker and Mr. Keys about Whitsand Bay east, the only special papers published on the county coleoptera deal exclusively with the Penzance and

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Land's End district and the Isles of Scilly. In the *Transactions of the Penzance Natural History and Antiquarian Society*, new series, vol. i (1880-4), E. D. Marquand gives a list of about four hundred and fifty species collected in that area, and supplements it towards the close of the same volume by thirty-eight more. In vol. iii of the same *Transactions* the Rev. John Isabell of Sennen, contributes a list of about a hundred additional species, thus raising the total to about six hundred. A paper by Marquand, 'The Beetles of West Cornwall,' in the *Report of the Royal Cornwall Polytechnic Society* for 1881, and a list of Coleoptera from the Isles of Scilly by G. C. Champion in vol. xxxiv of the *Entomologist's Monthly Magazine*, supplemented in vol. xxxv by the reprint of a Scillonian list by Fred Holmes that originally appeared in 1836 in vol. ii of the *Transactions of the Entomological Society*, practically complete the literature of the Cornish Coleoptera.

The material for this article has for the most part been brought together by the exertions of the students of the County Technical Schools at Truro, and there are few districts in Cornwall in which they have not collected. The work done by Mr. A. G. Peter around Launceston, by Mr. H. Thomas at Lostwithiel and the valley of the Lynher, and by Mr. F. J. Polkinghorne, Mr. Joseph Tregelles, and the late Mr. R. O. Waters around Truro, has been of exceptional value. The amount done by the many willing workers may be to some extent realized from the fact that they have among them enabled the writer to add about eight hundred species to the county list. In addition to this indispensable work by the students, the writer received invaluable help from Mr. J. H. Keys of Plymouth, who has assiduously collected for years in the extreme south-east of the county, and who kindly prepared an annotated list of all the Cornish species he had taken. His cordial thanks are also due to Mr. E. C. H. Davies of St. Issey for local collections, to Mr. C. G. Lamb of Cambridge University, and to the Rev. J. Isabell of Sennen for notes of captures on the north coast.

More than sixty years ago the late Vernon Wollaston remarked that Cornwall—and he referred more especially to the eastern parts of the county—was one of the poorest districts for beetles he had ever searched. So far as the total number of individuals is concerned its poverty, even in many apparently favourable localities, is still very evident to anyone who has collected elsewhere. Occasionally, of course, a particular species may locally become extraordinarily abundant, like *Otiorrhynchus picipes* about Gulval in 1878, *Rhizotrogus solstitialis* at Bodmin in 1892, *Ceutorrhynchus litura* in the Land's End district in 1899, the ordinary cockchafer at Perranporth, *Serica brunnea* at Gwythian, and *Heliopathes gibbus* at Bude in 1902, *Cicindela campestris* on St. Mary's, Scilly, in April, 1903, *Carabus nemoralis* about Truro, and *Broscus cephalotes* at Falmouth in 1904; and in many spots one may find a plentiful and varied assortment of beetles. Still the average coleopterid population falls very considerably below that of the sister-county Devon. A number of beetles generally regarded as common or even abundant throughout England are represented in our collections by one or at most a few specimens only. On the other hand, though the scarcity of individual beetles is at times monotonous, the number of species in the county must be considerable, for, though the lists have no pretensions to completeness, about sixteen hundred species have been collected and identified during the past seven years. Many of the species are of course extremely local or of very uncertain appearance, and there seems to be no such thing as finality about any of our local lists, however restricted may be the area of observation. On one particular hedgebank that has been under close attention for the past six years for the purpose of furnishing a biological record, a greater number of beetles not previously recorded therefrom was observed in 1905 than in any other season since the completion of the first year's hedgebank calendar in December, 1900.

CICINDELIDAE

- Cicindela campestris*, L. S.¹
— *maritima*, Dej. *Holywell Bay*,
near *Newquay*

CARABIDAE

- Cychrus rostratus*, L. *Trebartha*,
mostly on high ground;
above *Liskeard*; *Trewince*,
Gerrans; *Penzance*

¹ Where beetles that are common on the mainland have been taken at Scilly, their names are followed by an 'S' on the list.

CARABIDAE (continued)

- Carabus intricatus*, L. Under the
bark of trees near *Cartham-
martha*; two taken by the
Rev. G. Lupton Allen at
sugar, near *Millook*, in 1905
— *catenulatus*, Scop.
— *nemoralis*, Müll.
— *violaceus*, L.
var. *exasperatus*, Duft.
N. Cornwall
— *granulatus*, L. Apparently
scarce; *Truro*; *Penzance*
— *monilis*, F. *Caerhayes*; *Port-
scatbo*

CARABIDAE (continued)

- Carabus arvensis*, F. *Perranzabuloe*
Calosoma sycophanta, L. A single
specimen captured running
along the pavement at *Fowey*,
June, 1899
Notiophilus biguttatus, F.
— *substriatus*, Wat.
— *quadripunctatus*, Dej. *Saltash*
— *aquaticus*, L. S.
— *palustris*, Duft.
Leistus spinibarbis, F.
— *fulvibarbis*, Dej. S.
— *ferrugineus*, L.
— *rufescens*, F. *St. Germans*

A HISTORY OF CORNWALL

CARABIDAE (continued)

Nebria complanata, L. One specimen obtained at *Bude*, and two at *Tresco, Scilly*, under the fronds of *Asplenium marinum* at the foot of some rocks
 — *brevicollis*, F.
Elaphrus riparius, L.
 — *cupreus*, Duft.
 — *uliginosus*, F. *Marazion* (Baily)
Loricera pilicornis, F. S.
Clivina fossor, L.
 — *collaris*, Herbst
Dyschirius thoracicus, Rossi. *Maenporth*, two specimens with *Bledius arenarius*
 — *impunctipennis*, Daws. Between *Perranporth* and *Newquay*, along with *Bledius arenarius*
 — *salinus*, Schaum. *Par*; *St. Erth*
 — *aeneus*, Dej. *Marazion* (Baily)
 — *globosus*, Herbst
Broscus cephalotes, L. Under stones on sand above high-water mark, *Whitsand Bay, Downderry* (Keys); *Newquay*; *Falmouth*; *Penzance*; not uncommon, *St. Mary's, Scilly*
Panagaeus quadripustulatus, Sturm. Taken by Keys at *Whitsand Bay* in 1890, and by Thomas, near *Looe*, in 1901
Badister bipustulatus, F.
 — *sodalis*, Duft.
Chlaenius vestitus, Payk. Several specimens taken once only under stones in wet ground near *Millbrook* (Keys); under damp moss by the side of the *Fowey*, near *Lostwithiel*
 — *nigricornis*, F.
Stenolophus skrimshirani, Steph. At roots of grass, *Pencalenick, Truro*; *Penzance*
Acupalpus exiguus, Dej. *Wadebridge*
 var. *luridus*, Dej. Under stones on grass, *Whitsand Bay*; *Portscatho*
 — *meridianus*, L.
 — *consputus*, Duft. Pools in the *Land's End* district
Bradycellus distinctus, Dej.
 — *verbasci*, Duft.
 — *harpalinus*, Dej.
 — *similis*, Dej.
Harpalus sabulicola, Panz. *Looe*
 — *rotundicollis*, Fairm. Brackish marsh, near *Par*
 — *punctatulus*, Duft. One specimen top of cliffs, *Newquay*
 — *azureus*, F. Once only at *Tregantle* (Keys)

CARABIDAE (continued)

Harpalus puncticollis, Payk.
 — *rufibarbis*, F. Near *Liskeard*
 — *ruficornis*, F. S.
 — *aeneus*, F. S.
 — *consentaneus*, Dej. Among debris on the shore at *Cremyll*, in number; under stones on old rubble heaps at *Tregantle* (Keys); at edge of an old quarry, *Swanpool, Falmouth*; sparingly on *St. Mary's, St. Agnes*, and *St. Martin's, Scilly* (Champion)
 — *tenebrosus*, Dej. Recorded as common at *Whitsand Bay* by J. J. Walker in 1875-6, but he could not find it in 1885. Recently it has been taken there frequently by Keys
 — *rubripes*, Duft. Has been obtained about *Penzance*, on *Hayle Towans*, and at *Whitsand Bay east*; occurs on *St. Mary's, Scilly*
 — *latus*, L. S.
 — *melancholicus*, Dej. Taken near the Fern-pits, *Newquay*, 1902
 — *tardus*, Panz. At *Portscatho* on stones at high-water mark; *Padstow* (Lamb); *St. Mary's and Tresco, Scilly* (Champion)
 — *servus*, Duft. Eight specimens taken in July, 1891, on a sandy patch beside the path on the *Towans* at *Lelant*
 — *anxius*, Duft.
 — *serripes*, Sch. Above *Liskeard*
 — *ignavus*, Duft. At times abundant under stones on the grassy slopes of *Whitsand Bay east*; taken among thin grass on the sand hills at *Bude*
 — *neglectus*, Dej. One specimen at *Swanpool* running over the edge of quarry debris
Dichirotrichus obsoletus, Dej.
 — *pubescens*, Payk.
Anisodactylus binotatus, F. S.
 var. *spurcaticornis*, Dej. *Newham, Truro*, with the type; *Scilly*
 var. *atricornis*, Steph. *Land's End* (Isabell)
 — *poeciloides*, Steph.
Diachromus germanus, Er. Taken on the pathway, near *Falmouth* station, in June, 1904
Stomis pumicatus, Panz.
Pterostichus cupreus, L.
 var. *affinis*, Sturm. *Marazion*
 — *versicolor*, Sturm
 — *madidus*, F.
 — *aethiops*, Panz. *Altarnun*

CARABIDAE (continued)

Pterostichus oblongo-punctatus, F.
 Under stones in wood at *Doublebois*
 — *niger*, Schall.
 — *vulgaris*, L.
 — *anthracinus*, Ill. Found at *Scilly* by F. Holmes (?)
 — *nigrita*, F. S.
 — *minor*, Gyll.
 — *strenuus*, Panz. S.
 — *diligens*, Sturm
 — *vernalis*, Gyll.
 — *striola*, F.
Amara fulva, Dej.
 — *apricaria*, Sturm. S.
 — *spinipes*, auct.
 — *convexiuscula*, Marsh.
 — *patricia*, Duft. Two specimens in a tiny brackish marsh by the side of the *Gannel, Newquay*
 — *bifrons*, Gyll. One specimen, *Downderry* (Keys); not rare on *St. Mary's, Scilly*
 — *ovata*, F. S.
 — *similata*, Gyll.
 — *acuminata*, Payk.
 — *tibialis*, Payk.
 — *lunicollis*, Schödd.
 — *familiaris*, Duft. S.
 — *lucida*, Duft.
 — *trivialis*, Gyll. S.
 — *communis*, Panz.
 — *continua*, Thoms. *Tregantle*; *Truro*
 — *plebeia*, Gyll. *Tregantle* (Keys); *Newquay*
Calathus cisteloides, Panz. S.
 — *fuscus*, F. S.
 — *flavipes*, Fourc. *Liskeard*
 — *mollis*, Marsh. S.
 — *melanocephalus*, L. S.
 — *micropterus*, Duft. Two specimens above *Trebartha*
 — *piceus*, Marsh.
Taphria nivalis, Panz. *Land's End*
Pristonychus terricola, Herbst
Sphodrus leucophthalmus, L. E. *Cornwall*
Anchomenus angusticollis, F. At tree roots on the river bank at *Doublebois*
 — *dorsalis*, Müll.
 — *albipes*, F. S.
 — *oblongus*, Sturm
 — *marginatus*, L. S.
 — *parumpunctatus*, F. S.
 — *atratus*, Duft.
 — *viduus*, Panz. *Marazion Marsh*
 var. *moestus*, Duft. *Penzance*
 — *micans*, Nic. Bank of *Lynher*.
 — *fuliginosus*, Panz.
 — *gracilis*, Gyll. By the *Marazion Marsh*
 — *piceus*, L. Mouth of the *Seaton, Downderry* (Keys)

INSECTS

CARABIDAE (continued)

- Olisthopus rotundatus*, Payk. S.
Lymnaeum nigropiceum, Marsh.
 Once only under stones on rocky shore, *Whitsand Bay* (Keys)
Cilleus lateralis, Sam. Very local, but gregarious on shingly beaches near *Mt. Edgcombe* (Keys); near *Old Grimsby, Tresco*, attacking sandhoppers
Bembidium rufescens, Guér.
 — *quinquestriatum*, Gyll. *Land's End* (Isabell)
 — *obtusum*, Sturm
 — *guttula*, F.
 — *mannerheimi*, Sahl.
 — *biguttatum*, F.
 — *riparium*, Ol.
 — *aeneum*, Germ. *Par.*
 — *fumigatum*, Duft. *Hayle*
 — *assimile*, Gyll. *Marazion; Tresco, Scilly*
 — *articulatum*, Panz.
 — *minimum*, F.
 — *normannum*, Dej.
 — *gilvipes*, Sturm
 — *lampros*, Herbst
 — *tibiale*, Duft.
 — *atrocoeruleum*, Steph.
 — *decorum*, Panz.
 — *nitidulum*, Marsh.
 — *affine*, Steph.
 — *quadrignatum*, F.
 — *quadrinaculatum*, Gyll.
 — *lunatum*, Duft. Four specimens obtained near *Morwin-stow* in 1904; apparently the only record for the south-west of England
 — *concinnum*, Steph. *Penzance*
 — *femoratum*, Sturm. *Penzance*
 — *bruxellense*, Wesm. *Bishop's Wood, Truro*
 — *saxatile*, Gyll.
 — *littorale*, Ol. S.
 — *pallidipenne*, Ill. Among sedges by the side of the *Gannel*, near *Newquay*
 — *bipunctatum*, L. By the *Gannel* close to *Trevelper Bridge*
 — *ephippium*, Marsh.
 — *flammatum*, Clairv.
 — *varium*, Ol. In numbers on the muddy edges of a pond at the mouth of the *Seaton*, *Downderry*
Tachypus pallipes, Duft. Banks of the *Camel*
 — *flavipes*, L.
Perileptus areolatus, Creutz. Five specimens obtained near *Lan-dulph* in 1904
Aepus marinus, Ström. Under stones closely fitting to the ground below high-water mark on clayey shores at *Mount Edgcombe* (Keys); *St. Mary's, Scilly* (Champion)

CARABIDAE (continued)

- Aepus robinii*, Lab. At *Mount Edgcombe* with *A. marinus* (Keys)
Trechus lapidosus, Daws. In a rocky cove in *Whitsand Bay* (Keys); evidently well established in the *Land's End* district
 — *rubens*, F. Occurs sparingly in the *Penzance* district
 — *minutus*, F.
 var. *obtusus*, Er.
Pogonus littoralis, Duft.
 — *chalcus*, Marsh.
Odacantha melanura, Payk. Three specimens between *Hayle* and *St. Erth*, Sept., 1900
Lebia chlorocephala, Hoff.
 — *crux-minor*, L. Was recorded by Dawson from *Treneglos*
Demetrias unpunctatus, Germ. At the bottom of *Hayle* towans
 — *atricapillus*, L. S.
Dromius linearis, Ol.
 — *agilis*, F.
 — *meridionalis*, Dej.
 — *quadrinaculatus*, L.
 — *quadrinotatus*, Panz.
 — *quadrisignatus*, Dej. *Marazion*
 — *melanocephalus*, Dej.
 — *nigriventris*, Thoms. *Perran-porth*
Blechnus maurus, Sturm
Metabletus foveola, Gyll. S.
 — *truncatellus*, L.
 — *obsuro-guttatus*, Duft.
Lionychus quadrillum, Duft. Occurs very sparingly at *Swan-pool*
Brachinus crepitans, L.
Brychius elevatus, Panz.
Haplipus obliquus, F.
 — *confinis*, Steph. Canal near *Stratton*
 — *mucronatus*, Steph. Very sparingly near *Marhamchurch*
 — *flavicollis*, Sturm.
 — *fulvus*, F.
 — *cinereus*, Aubé
 — *ruficollis*, De G.
 — *fluvialis*, Aubé
 — *lineatocollis*, Marsh.
Pelobius tardus, Herbst
Noterus clavicornis, De G. Twice obtained near *Newquay*
 — *sparsus*, Marsh. Abundant in a pond at the mouth of the *Seaton* river (Keys)
Laccophilus interruptus, Panz. S.
 — *obscurus*, Panz.
Bidessus geminus, F. Above *Liskeard*; *Penzance*
Hyphidrus ovatus, L.
Coelambus versicolor, Schall
 — *inaequalis*, F. S.
 — *confluens*, F.
 — *impressopunctatus*, Schall

CARABIDAE (continued)

- Deronectes assimilis*, Payk.
 — *depressus*, F.
 — *duodecim-pustulatus*, F.
Hydroporus pictus, F. One specimen near *Altarnun*
 — *granularis*, L.
 — *flavipes*, Ol.
 — *lepidus*, Ol. *Land's End* district (Marquand)
 — *rivalis*, Gyll. One specimen in a collection formed around *Saltash*; two taken on the *Lower Lynher*
 — *dorsalis*, F. Scarce
 — *lineatus*, F.
 — *tristis*, Payk. *Penzance*
 — *angustatus*, Sturm
 — *gyllenhali*, Schiöd.
 — *palustris*, L.
 — *erythrocephalus*, L.
 — *longulus*, Muls. *Doublebois*
 — *memnonius*, Nic. *Penzance* (Marquand)
 — *nigrita*, F.
 — *pubescens*, Gyll.
 — *planus*, F.
 — *lituratus*, F.
 — *marginatus*, Duft. Near *St. German's*
Agabus guttatus, Payk.
 — *biguttatus*, Ol.
 — *paludosus*, F.
 — *unguicularis*, Thoms.
 — *didymus*, Ol. *Land's End* district
 — *nebulosus*, Först. *Land's End* (Isabell)
 — *conspersus*, Marsh. Abundant in a pond at the mouth of the *Seaton* river (Keys)
 — *femoralis*, Payk. *Land's End*
 — *sturmii*, Gyll.
 — *chalconotus*, Panz.
 — *bipustulatus*, L. S.
Platambus maculatus, L.
Ilybius fuliginosus, F.
 — *ater*, De G.
 — *obscurus*, Marsh.
 — *relatus agilis*, F.
Recurtus exoletus, Först.
 — *lverosus*, Steph. *Botus Fleming*
 — *bistriatus*, Berg.
Colymbetes fuscus, L.
Dytiscus punctulatus, F.
 — *marginalis*, L.
Acilius sulcatus, L.

GYRINIDAE

- Gyrinus natator*, Scop.
 — *elongatus*, Aubé
 — *marinus*, Gyll.
Orectochilus villosus, Müll. Near *Altarnun*, under stones in the *Linney*

A HISTORY OF CORNWALL

HYDROPHILIDAE

- Hydrobius fuscipes, L.
 Anacaena globulus, Payk. *Penlee*
 — limbata, F. *W. Cornwall*
 Philhydrus testaceus, F.
 — maritimus, Thoms. Found by
 Champion on *Samson, Scilly*.
 — melanocephalus, Ol.
 — coarctatus, Gredl. S.
 — minutus, F.
 Helochares lividus, Först.
 — punctatus, Sharp. *Land's End*
 Laccobius sinuatus, Mots
 — alutaceus, Thoms. *Land's End*
 Berosus signaticollis, Charp.
 — affinis, Brullé
 Limnebius truncatellus, Thoms.
 — papposus, Muls.
 — nitidus, Marsh.
 Chaetarthria seminulum, Herbst
 Helophorus rugosus, Ol.
 — nubilus, F.
 — intermedius, Muls. *Land's End*;
Pencalenick
 — aquaticus, L.
 — dorsalis, Marsh. *E. Cornwall*,
 rare
 — aeneipennis, Thoms.
 — mulsanti, Rye
 — affinis, Marsh.
 — brevicollis, Thoms. *Down-*
derry (Keys)
 — brevipalpis, Bedel
 Hydrochus elongatus, Schall
 — angustatus, Germ.
 Henicocerus exsculptus, Germ.
Near Altarnun
 Octhebius margipallens, Latr.
 Swarming at the muddy
 edges of a pond at the mouth
 of the *Seaton*, August, 1900
 (Keys). *St. Mary's and St*
Agnes, Scilly
 — marinus, Payk.
 — pygmaeus, F.
 — bicolon, Germ.
 — aeratus, Steph.
 — lejolisi, Muls et Rey. About
 fifty specimens of this new
 British species were obtained
 by Keys in stagnant salt
 water or brackish pools above
 high-tide mark near *Rame*
Hd., September, 1901; two
 specimens in a rock pool at
St. Mary's, Scilly (Champion)
 Hydraena testacea, Curt. Common
 above *Trebartha*
 — riparia, Kug.
 — nigrita, Germ.
 — gracilis, Germ.
 Cyclonotum orbiculare, F.
 Sphaeridium scarabaeoides, F. S.
 — bipustulatum, F. S.
 var. marginatum, F.
 Cercyon littoralis, Gyll. S.
 — depressus, Steph. *Whitsand*
Bay east; *Penzance*; *St.*
Mary's, Scilly

HYDROPHILIDAE (continued)

- Cercyon haemorrhous, Gyll.
 — haemorrhoidalis, Herbst
 — obsoletus, Gyll. *Land's End*.
 — aquaticus, Muls.
 — flavipes, F.
 — lateralis, Marsh.
 — melanocephalus, L.
 — unipunctatus, L. S.
 — quisquilius, L.
 — nigriceps, Marsh. *Whitsand*
Bay east (W. Hobbs)
 — pygmaeus, Ill.
 — terminatus, Marsh.
 — analis, Payk.
 — lugubris, Payk.
 — granarius, Er.
 — minutus, Muls.
 Megasternum boletophagum,
 Marsh.
 Cryptopleurum atomarium, F.

STAPHYLINIDAE

- Aleocharis ruficornis, Grav. Occurs
 in moss near the nests of
 Formica rufa in *Bishop's Wood*,
Truro
 — fuscipes, F. S.
 — lata, Grav.
 — brevipennis, Grav.
 — bipunctata, Ol. In carrion,
Whitsand; *Falmouth*; *St.*
Mary's, Scilly
 — lanuginosa, Grav.
 — moesta, Grav.
 — nitida, Grav. S.
 var. bilineata, Gyll. In
 decaying seaweed, *Ma-*
razion
 — morion, Grav.
 — grisea, Kr. In a dead sheep,
Rame (Keys); in decaying sea-
 weed, *Falmouth*; *Tresco, Scilly*
 — algarum, Faur. S.
 — obscurella, Er. S.
 Microglossa suturalis, Sahl.
 — pulla, Gyll.
 — gentilis, Märk. In the com-
 pany of ants, *Bishop's Wood*,
Truro
 Oxypoda spectabilis, Märk.
 — vittata, Märk.
 — opaca, Grav.
 — alternans, Grav.
 — longiuscula, Er.
 — haemorrhoea, Mann.
 — annularis, Sahl.
 (This difficult genus is well
 represented in woods, tide-
 refuse, moss and sandy ex-
 posures throughout the
 county, but the above are the
 only species that have been
 identified with certainty)
 Ischnoglossa prolixa, Grav.
 — corticina, Er. Under the bark
 of fallen branches, *Bishop's*
Wood, Truro

STAPHYLINIDAE (continued)

- Ocyusa incassata, Kr.
 — maura, Er.
 — picina, Aubé
 Phloeopora reptans, Grav.
 — corticalis, Grav.
 Ocalea castanea, Er.
 — badia, Er. *Scawswater, Truro*.
 Ilyobates nigricollis, Payk.
 Calodera aethiops, Grav.
 — umbrosa, Er. In decaying
 fungi, *Mount Edgcumbe*
 Chilopora longitarsis, Steph.
 Dinarda märkeli, Kies. Taken by
 Isabell in the *Land's End* dis-
 trict from the nests of Formica
 rufa
 — dentata, Grav. Found in the
 nest of Formica fusca at
Whitsand Bay east
 Ateomes emarginatus, Payk. *Pen-*
zance district, in the nests of
 Formica rufa, scarce (Mar-
 quand)
 — paradoxus, Grav. Found by
 Keys at *Whitsand Bay* and by
 Isabell in the *Land's End*
 district; *Bishop's Wood, Truro*
 Myrmedonia limbata, Payk.
 — funesta, Grav.
 Astilbus canaliculatus, F. S.
 Callicerus obscurus, Grav.
 — rigidicornis, Er. *Bodmin*
 Thamiaraea cinnamomea, Grav.
 — hospita, Märk.
 Notothecta flavipes, Grav.
 — anceps, Er.
 Alianta incana, Er. In stems of
 Typha latifolia, *Marazion*
 — plumbea, Wat. In seaweed,
Tregantle; Falmouth (Fowler)
 Homalota currax, Kr. Valley of
 the *Lynher*
 — languida, Er. Two specimens
 in marsh-land, *Wadebridge*;
 several in flood refuse, *Lost-*
withiel
 — pavens, Er. Under vegetable
 refuse, *Bishop's Wood, Truro*.
 — cambrica, Woll. One on the
 middle reaches of the *Lynher*
 — gregaria, Er. S.
 — longula, Heer. In wet shingle,
 fresh or brackish water, *Down-*
derry (Keys); *Mount Edg-*
cumbe (E. A. Newbery)
 — littorea, Sharp. *Falmouth*
 — imbecilla, Wat. Under rotten
 seaweed, *Falmouth* (Fowler)
 — luteipes, Er.
 — fallax, Kr.
 — luridipennis, Mann.
 — elongatula, Grav. Under sea-
 weed *Mevagissey; Penzance*
 (Marquand)
 — volans, Scrib.
 — vestita, Grav. S.
 — nitidula, Kr. In a dead tree-
 creeper, *Killtow, Truro*

INSECTS

STAPHYLINIDAE (*continued*)

- Homalota graminicola, Gyll.
- halobrectha, Sharp
- puncticeps, Thoms.
- occulta, Er. In fungi beyond *Truro* viaduct
- fungivora, Thoms.
- picipes, Thoms
- angustula, Gyll. *Swanpool, Falmouth*
- caesula, Er. At the roots of grass among stones at *Carbis Bay*
- circellaris, Grav.
- cuspidata, Er. In cracks in a Scotch pine, *Bishop's Wood, Truro*
- analis, Grav. S.
- decipiens, Sharp
- depressa, Gyll.
- aquatica, Thoms.
- aeneicollis, Sharp
- xanthoptera, Steph.
- euryptera, Steph.
- trinitata, Kr.
- triangulum, Kr.
- fungicola, Thoms.
- boletobia, Thoms.
- ravilla, Er.
- palustris, Kies.
- oblita, Er.
- sericea, Muls.
- indubia, Sharp. *St. Mary's, Scilly* (Champion)
- nigra, Kr.
- sordidula, Er.
- cauta, Er.
- villosula, Kr.
- marcida, Er.
- longicornis, Grav. In dead sheep, *Rame* (Keys)
- sordida, Marsh. S.
- testudinea, Er. In decaying leaf-mould at *Bodmin*
- pilosiventris, Thoms. *St. Mary's, Scilly* (Champion)
- laticollis, Steph.
- orbata, Er. *Newquay*
- fungi, Grav. S.
var. *dubia*, Sharp
- orphana, Er. Three specimens at *Looe*, 1901
- Gnypeta labilis, Er.
- Tachyusa flavitarsis, Sahl. Banks of the *Fowey* near *Lostwithiel*
- atra, Crav. In a tiny marsh by the *Lynher*
- Xenusia uvida, Er. *Cremyll and Whitsand Bay* (Keys)
- sulcata, Kies. S.
- Falagria sulcata, Payk.
- thoracica, Curt. Under stones with *Myrmica rubra*, between *Par* and *Luxulian*
- obscura, Grav. S.
- Autalia impressa, Ol.
- rivularis, Grav.
- Gyrophæna affinis, Mann.
- gentilis, Er.

STAPHYLINIDAE (*continued*)

- Gyrophæna nana, Payk.
- minima, Er.
- Agaricochara laevicollis, Kr.
- Leptusa fumida, Er.
- analis, Gyll. Valley of the *Lynher*
- Sipalia ruficollis, Er.
- testacea, Bris. Found by Keys under stones below high-water mark at *Mount Edgcumbe*
- Bolitochara bella, Märk.
- Actocharis readingi, Sharp. Described from specimens obtained by Reading and Wolleston in the neighbourhood of Plymouth. In March, 1886, it was found by J. J. Walker at Falmouth 'on the undersides of large stones sunk in the sands in places where a little trickle of fresh water came down from the cliffs above.' Lately it has been taken by Keys on the shore at Mount Edgcumbe in decaying sea-weed upon shingle
- Phytosus spinifer, Curt. In decaying sea-weed, *Whitsand Bay east*
- balticus, Kr. *Whitsand Bay*, often abundant (Keys); in dead star-fish, *Gyllyngvase, Falmouth*
- nigriventris, Chevr. Occurs with balticus at *Whitsand Bay*, but is rare. Keys, who found it there, says 'The type does not appear to occur, as all the examples I have taken have three and four black abdominal segments instead of the usual two and a half only.' (E. M. M. for 1903, p. 19)
- Diglossa mersa, Hal. Occurs under stones below high-water mark at *Mount Edgcumbe* (Keys); near the mouth of the *Helford* river; *St. Mary's, Scilly*
- Hygronoma dimidiata, Grav. Marshy land near *Altarnun*
- Oligota inflata, Mann.
- pusillima, Grav.
- granaria, Er.
- apicata, Er. Found under dead moss at *Bishop's Wood, Truro*, in large numbers in 1901
- Myllæna brevicornis, Matth.
- Gymnusa brevicollis, Payk. Above *Trebartha*
- Hypocypsus longicornis, Payk. S. [The other species of this genus have not been determined]

STAPHYLINIDAE (*continued*)

- Conosoma littoreum, L.
- pubescens, Grav.
- pedicularium, Grav. *Land's End* (Isabell)
- lividum, Er.
- Tachyporus obtusus, L.
- formosus, Matth. Has been taken about *Land's End*, chiefly by Isabell
- solutus, Er.
- chrysomelinus, L.
- humerosus, Er.
- tersus, Er.
- hypnorum, F. S.
- pusillus, Grav. S.
- transversalis, Grav.
- Lamprinus saginatus, Grav. A single example discovered in moss on the outskirts of *Bishop's Wood, Truro* in 1900
- Cilea silphoides, L.
- Tachinus flavipes, F. Taken at the *Scawswater* saw-mill near *Truro*
- humeralis, Grav.
- bipustulatus, F.
- rufipes, L.
- subterraneus, L. S.
var. *bicolor*, Grav.
- marginellus, F.
- laticollis, Grav. *Penzance*
- Megacronus cingulatus, Mann. Taken occasionally on *Thuidium tamariscifolium* on old hedgebanks about *Truro*
- analis, F.
- inclinans, Grav. One specimen under larch poles at *Scawswater*
- Bolitobius lunulatus, L.
- trinitatus, Er.
- pygmaeus, F.
- Mycetoporus lucidus, Er.
- splendens, Marsh. *Land's End* (Isabell); on path behind *Moresk Mill, Truro*
- lepidus, Grav.
- longulus, Mann.
- splendidus, Grav.
- Habrocerus capillaricornis, Grav.
- Trichophya pilicornis, Gyll.
- Heterothops binotata, Er. Under sea-weed near *Newquay*; *St. Mary's, Scilly*
- dissimilis, Grav. Among sea-weed, *Downderry* and elsewhere
- Quedius microps, Grav. Taken from a rotten oak near *Kilkhampton*
- mesomelinus, Marsh.
var. *fageti*, Thoms.
- fulgidus, F. S.
- cruentus, Ol.
- cinctus, Payk.
- fuliginosus, Grav.
- tristis, Grav.
- molochinus, Grav.

A HISTORY OF CORNWALL

STAPHYLINIDAE (*continued*)

- Quedius picipes*, Mann.
 — *nigriceps*, Kr.
 — *fumatus*, Steph.
 — *maurorufus*, Grav.
 — *umbrinus*, Er. Very local, but not uncommon where it does occur. Keys mentions seeing fourteen driven out of a little salt marsh near *Mount Edgumbe* by the rising tide, surely a very unusual habitat!
 — *scintillans*, Grav.
 — *obliteratus*, Er. This species, new to the *British Isles*, was taken in straw by Keys in *Penlee* woods. (*E. M. M.* for 1902, p. 147)
 — *auricomus*, Kies. Near *Liskeard*
 — *rufipes*, Grav.
 — *attenuatus*, Gyll.
 — *semiaeneus*, Gyll.
 — *boops*, Grav. S.
Creophilus maxillosus, L. S.
Emus hirtus, L. First recorded from the county by A. H. Jenkin, who captured one at the *Lizard* in 1888. A second specimen was taken by one of the girl students in 1901 close to *Falmouth* station and brought alive in her handkerchief to *Truro* under the impression it was a bee! A few days later Waters took one on horse droppings near the same place, and another was captured near *Swanpool* that same year
Leistotrophus nebulosus, F.
 — *murinus*, L.
Staphylinus pubescens, De G.
 — *stercorarius*, Ol. *Falmouth*; *Penzance*
 — *erythropterus*, L.
 — *caesareus*, Ceder.
Ocypus olens, Müll. S.
 — *similis*, F. Found at *Scilly* by F. Holmes
 — *brunnipes*, F.
 — *cupreus*, Rossi. S.
 — *ater*, Grav. Under stones in damp places near the shore, *Mount Edgumbe*; *Looe*; *Boscastle*; *Padstow* (Lamb); *Land's End*; *St. Mary's* and *St. Agnes, Scilly*
 — *morio*, Grav.
 — *compressus*, Marsh. *Land's End*
Philonthus splendens, F. S.
 — *intermedius*, Boisd.
 — *laminatus*, Creutz.
 — *aeneus*, Rossi. S.
 — *proximus*, Kr. *Mawgan-in-Pydar*; *Falmouth*; *Land's End*
 — *carbonarius*, Gyll.

STAPHYLINIDAE (*continued*)

- Philonthus atratus*, Grav. *Padstow* (Lamb); *Penzance* (Marquand)
 — *decorus*, Grav.
 — *politus*, F. S.
 — *lucens*, Er. Under moss, *Bishop's Wood, Truro*
 — *varius*, Gyll. S.
 — *marginatus*, F.
 — *albipes*, Grav.
 — *cephalotes*, Grav.
 — *fimetiarius*, Grav. S.
 — *sordidus*, Grav.
 — *ebenus*, Grav.
 — *fumigatus*, Er.
 — *debilis*, Grav.
 — *sanguinolentus*, Grav. *Land's End*; *St. Mary's, Scilly*
 — *cruentatus*, Gmel. S.
 — *longicornis*, Steph.
 — *varians*, Payk. S.
 — *agilis*, Grav.
 — *ventralis*, Grav. *Whitsand Bay east* (Fowler); *Par*
 — *discoideus*, Grav.
 — *quisquiliarius*, Gyll.
 var. *dimidiatus*, Er. *Land's End*; *St. Mary's, Scilly* (Champion)
 — *splendidulus*, Grav.
 — *fumarius*, Grav.
 — *micans*, Grav. Muddy edges of a pond at mouth of the *Seaton* river (Keys)
 — *trossulus*, Nord. S.
 — *fulvipes*, F. *Newquay*
 — *pullus*, Nord. Has been recorded by Marquand from the *Penzance* district, but possibly in error
Cafius fucicola, Curt. In seaweed at *Tregantle* (Keys); *Falmouth* (Fowler); *Padstow*; *St. Mary's* and *St. Agnes, Scilly*
 — *xantholoma*, Grav. S.
 var. *variolosus*, Sharp. *Whitsand Bay* (Keys); *Falmouth* (Fowler); *St. Mary's* and *Tresco, Scilly*
 — *sericeus*, Holme. S.
Actobius cinerascens, Grav.
 — *signaticornis*, Rey. One specimen near a trickle of water on the beach at *Whitsand Bay* (Keys)
 — *procerulus*, Grav.
Xantholinus fulgidus, F. *Truro*; *Penzance*
 — *glabratus*, Grav.
 — *punctulatus*, Payk.
 — *ochraceus*, Gyll.
 — *atratus*, Heer. In the nest of *Formica rufa*, *Bishop's Wood, Truro*
 — *tricolor*, F. *Padstow*; in decaying seaweed, *Porth Cressa, St. Mary's, Scilly*
 — *linearis*, Ol. S.

STAPHYLINIDAE (*continued*)

- Xantholinus longiventris*, Heer.
Leptacinus parumpunctatus, Gyll.
 — *batychnus*, Gyll.
 — *linearis*, Grav.
 — *formicetorum*, Märk. In nests of *Formica rufa*, *Bishop's Wood, Truro*
Baptolinus alternans, Grav.
Othius fulvipennis, F.
 — *laeviusculus*, Steph.
 — *melanocephalus*, Grav.
 — *myrmecophilus*, Kies. *Tregantle, Looe*; in moss, *Pennance, Falmouth*
Lathrobium elongatum, L.
 — *boreale*, Hoch.
 — *fulvipenne*, Grav.
 — *angustatum*, Lac.
 — *brunnipes*, F.
 — *longulum*, Grav.
 — *quadratum*, Payk. Banks of the *Lynher*
 — *terminatum*, Grav.
 — *multipunctum*, Grav. *Swanpool*; *Land's End*; *Scilly* (Holmes)
Cryptobium glaberrimum, Herbst
Stilicus rufipes, Germ.
 — *orbiculatus*, Er. *Land's End*; *St. Martin's, Scilly*
 — *similis*, Er.
 — *affinis*, Er.
Scopaeus sulcicollis, Steph.
Medon pocofer, Payk.
 — *brunneus*, Er.
 — *fuscus*, Mann.
 — *apicalis*, Kr.
 — *propinquus*, Bris.
 — *melanocephalus*, F.
Lithocharis ochracea, Grav.
Sunius filiformis, Latr. Taken by J. J. Walker many years ago at *Whitsand Bay*, and found there lately at roots in sandy places by Keys
 — *angustatus*, Payk.
Paederus littoralis, Grav.
 — *riparius*, L.
 — *fuscipes*, Curt. *Cotehele* (Big-nell); *Tressilian, Truro*; by the side of the *Gannel, Newquay*; *St. Mary's* and *Bryher, Scilly*
Evaesthetus scaber, Thoms. *Newquay*
 — *ruficapillus*, Lac.
 — *laeviusculus*, Mann.
Dianous caeruleus, Gyll. In moss on the edges of a little stream running down to the shore at *Whitsand Bay* (Keys); bank of the *Linney, Altarnun*
Stenus biguttatus, L.
 — *bipunctatus*, Er.
 — *guttula*, Müll.
 — *bimaculatus*, Gyll.
 — *juno*, F. S.
 — *guynemeri*, Duv. *Trebartha*

INSECTS

STAPHYLINIDAE (continued)

- Stenus speculator*, Er.
 — *providus*, Er.
 var. *rogeri*, Kr. *Land's End* (Isabell)
 — *lustrator*, Er. *Millook* (G. L. Allen)
 — *bupthalmus*, Grav.
 — *melanopus*, Marsh.
 — *morio*, Grav. Reported from the *Penzance* district by Marquand
 — *canaliculatus*, Gyll.
 — *nitens*, Steph.
 — *pusillus*, Er.
 — *fuscipes*, Grav. *Land's End* district
 — *declaratus*, Er.
 — *crassus*, Steph.
 — *brunnipes*, Steph.
 — *subaeneus*, Er. *Penzance*
 — *ossium*, Steph.
 — *geniculatus*, Grav.
 — *impressus*, Germ.
 — *flavipes*, Steph.
 — *pubescens*, Steph.
 — *pallitarsis*, Steph. Not uncommon in *S. E. Cornwall*
 — *bifoveolatus*, Gyll.
 — *nitidiusculus*, Steph.
 — *picipennis*, Er.
 — *picipes*, Steph.
 — *cicindeloides*, Grav.
 — *similis*, Herbst
 — *solutus*, Er. Occurs sparingly about *Newquay*, and has been taken at *Padstow* by Lamb
 — *tarsalis*, Ljun.
 — *paganus*, Er. *Whitsand Bay*; *Looe*
 — *latifrons*, Er. *Land's End*
 — *fornicatus*, Steph. *Millook* (G. L. Allen)
Oxyporus rufus, L.
Bledius spectabilis, Kr.
 — *tricornis*, Herbst
 — *unicornis*, Germ.
 — *arenarius*, Payk. *Perranporth*
Platystethus arenarius, Fourc.
 — *cornutus*, Gyll.
Oxytelus rugosus, Grav.
 — *insecatus*, Grav.
 — *sculptus*, Grav.
 — *laqueatus*, Marsh.
 — *piceus*, L. *Truro*; *Falmouth*; *Penzance*; under seaweed
 — *inustus*, Grav.
 — *sculpturatus*, Grav.
 — *maritimus*, Thoms. In decaying seaweed on the shore at *Whitsand Bay*. The var. with testaceous elytra also occurs with the type (Keys). *Mevagissey*; *Marazion*
 — *nitidulus*, Grav.
 — *complanatus*, Er.
 — *tetracarinatus*, Block
Haploderus coelatus, Grav.

STAPHYLINIDAE (continued)

- Ancyrophorus omalinus*, Er. Valley of the *Lynher*
 — *aureus*, Fauv.
Trogophlaeus bilineatus, Steph.
 — *elongatulus*, Er.
 — *fuliginosus*, Grav. *Mount Edgcumbe* (Keys)
 — *halophilus*, Kies. Under stones below high tide on a muddy flat at *South Down*
 — *corticinus*, Grav.
 — *pusillus*, Grav.
 — *tenellus*, Er. One taken by Keys at *Whitsand Bay*
 — *anglicanus*, Sharp. First taken by Keys at *Whitsand Bay* in April, 1900; may prove identical with *T. unicolor*, Steph. (*E.M.M.* Oct. 1900), p. 232)
Syntomium aeneum, Müll.
Lesteva longelytrata, Goeze. S.
 — *pubescens*, Mann. In the wet moss of waterfalls, *Trebartha*
 — *sicula*, Er.
Olophrum piceum, Gyll.
Lathrimaemum atrocephalum, Gyll.
 — *unicolor*, Steph.
Micralymma brevipenne, Gyll. Under stones below high tide, *Mount Edgcumbe* (Keys); *Falmouth*
Philorhinum sordidum, Steph.
Omalius rivulare, Payk.
 — *laeviusculum*, Gyll. *Whitsand Bay*; *Mevagissey*; *Scilly*
 — *riparium*, Thoms. *Whitsand Bay*; *Penzance*; *St. Mary's, Scilly* (Champion)
 — *oxyacanthae*, Grav. *Millook*
 — *excavatum*, Steph.
 — *caesum*, Grav.
 — *pusillum*, Grav.
 — *punctipenne*, Thoms. Under ash bark *Trebartha*
 — *rufipes*, Fourc.
 — *vile*, Er.
 — *iopterum*, Steph. *E. Cornwall*
 — *planus*, Payk. *E. Cornwall*
 — *concinnum*, Marsh.
 — *deplanatum*, Gyll. *Tregantle*; *Penzance*
 — *striatum*, Grav.
Anthobium minutum, F.
 — *ophthalmicum*, Payk.
 — *torquatum*, Marsh.
 — *sorbi*, Gyll.
Proteinus ovalis, Steph.
 — *brachypterus*, F.
 — *macropterus*, Gyll.
 — *atomarius*, Er. Beyond *Altarnun*
Megarthus denticollis, Beck
 — *affinis*, Müll.
 — *depressus*, Lac.
 — *sinuatocollis*, Lac.
 — *hemipterus*, Ill.

STAPHYLINIDAE (continued)

- Phloeobium clypeatum*, Müll. At roots, *Whitsand Bay east*
Phloeocharis subtilissima, Mann.
Prognatha quadricornis, Lac. Under the bark of ash trees, *Bodmin*

PSSELAPHIDAE

Pselaphus heisei, Herbst
Tychus niger, Payk.
Bythinus glabratus, Rye
 — *puncticollis*, Denny
 — *validus*, Aubé
 — *bulbifer*, Reich
 — *curtisi*, Denny
 — *securiger*, Reich. Taken several times in the *Penzance* district
 — *burrelli*, Denny. Near *Bude*
Batrissus venustus, Reich. *Penzance* district (Marquand)
Bybaxis sanguinea, L.
Bryaxis fossulata, Reich
 — *haematica*, Reich. Associated with ants, *Newquay*
 — *juncorum*, Leach
Trichonyx märkeli, Aubé
 — *sulcicollis*, Reich
Euplectus karsteni, Reich
 — *signatus*, Reich. *Falmouth* (Fowler)
 — *nanus*, Reich
 — *sanguineus*, Denny
Claviger testaceus, Preyss. In nests of *Lasius flavus* near *Launceston*

SCYDMAENIDAE

- Neuraphes elongatulus*, Müll. One at roots of grass, *Whitsand Bay* (Keys)
 — *sparshalli*, Denny
Scydmaenus collaris, Müll.
 — *pusillus*, Müll. *Launceston* (Peter)
Euconnus fimetarius, Chaud.
Eutheia scydmaenoides, Steph.
Cephennium thoracicum, Müll.

LEPTINIDAE

- Leptinus testaceus*, Müll. Valley of the *Lynher*

SILPHIDAE

- Calyptomerus dubius*, Marsh.
Clambus armadillo, De G. Under cut rushes, *Lostwithiel*
 — *minutus*, Sturm. Haystack bottoms near *Stratton*
Agathidium nigripenne, Kug. Under bark, *Doublebois*, and *Bishop's Wood, Truro*
 — *atrum*, Payk. Under damp straw, *Newquay*

A HISTORY OF CORNWALL

SILPHIDAE (*continued*)

- Agathidium seminulum, L.
 — nigrinum, Sturm
 Liodes humeralis, Kug.
 Cyrtusa pauxilla, Schmidt. *E. Cornwall*
 Anisotoma cinnamomea, Er. *Calstock*
 — dubia, Kug. *Tregantle*
 — nigrita, Schmidt.
 — parvula, Sahlb. *St. Germans*
 Colenis dentipes, Gyll.
 Necrophorus humator, F.
 — mortuorum, F.
 — vestigator, Hersch.
 — ruspator, Er. *Penzance district (Marquand)*
 — interruptus, Steph. *Phillack (Fowler)*
 — vespillo, L.
 Necrodes littoralis, L.
 Silpha tristis, Ill.
 — obscura, L. *The Lizard, 1889 (Col. Yerbury); Penzance district (Marquand)*
 — quadripunctata, L. *On oak, Coombe valley, Kilkhampton*
 — opaca, L. *In the larval stage this is occasionally destructive to mangels, but the damage done by this pest in Cornwall has not so far been serious. In 1899 complaints were received from the Wadebridge district, and in 1901 and 1902 several fields about Liskeard were injured, but as a rule the beetle is somewhat scarce, and one may collect over a considerable area for an entire season without capturing a specimen*
 — thoracica, L.
 — rugosa, L.
 — sinuata, F.
 — dispar, Herbst. *Occurs sparingly under refuse in the Penzance district*
 — laevigata, F.
 — atrata, L. S.
 Choleva angustata, F.
 — cisteloides, Fröhl.
 — spadicea, Sturm. *Valley of the Lynher*
 — agilis, Ill.
 — velox, Spence
 — wilkini, Spence
 — anisotomoides, Spence
 — fusca, Panz.
 — nigricans, Spence
 — grandicollis, Er.
 — nigrita, Er.
 — tristis, Panz.
 — kirbyi, Spence
 — chrysomeloides, Panz.
 — fumata, Spence
 — watsoni, Spence
 Ptomaphagus sericeus, F.

SILPHIDAE (*continued*)

- Colon viennense, Herbst. *Padstow*
 — dentipes, Sahl.
 var. zebei, Kr.
 — brunneum, Latr.

HISTERIDAE

- Hister unicolor, L.
 — cadaverinus, Hoff.
 — succicola, Thoms.
 — stercorarius, Hoff. *One near Saltash (W. Hobbs)*
 — purpurascens, Herbst
 — carbonarius, Ill.
 — 12-striatus, Schr.
 — bimaculatus, L. *Rare and single*
 Carcinops minima, Aubé. *Swanpool*
 Paromalus flavicornis, Herbst
 Dendrophilus punctatus, Herbst. *Round the head of Mount's Bay*
 — pygmaeus, L. *Newquay*
 Saprinus nitidulus, Payk.
 — aeneus, F.
 — quadristriatus, Hoff. *Reported by F. Holmes from Scilly in 1836, but requires confirmation*
 — rugifrons, Payk. *Newquay*
 — maritimus, Steph. S.
 Abraeus globosus, Hoff.
 Acritus punctum, Aubé. *In May, 1892, Keys found a number in decaying seaweed on the sands at Tregantle, but in spite of careful and repeated search not a single specimen has been seen since*
 — minutus, Herbst
 Onthophilus striatus, F.

SCAPHIDIIDAE

- Scaphidium quadrimaculatum, Ol.
One specimen from Liskeard
 Scaphisoma agaricinum, L. *From rotting wood attacked by fungi, Bishop's Wood, Truro*

TRICHOPTERYGIDAE

- Pteryx suturalis, Heer. *Launceston*
 Ptinella denticollis, Fairm.
 Trichopteryx atomaria, De G.
 — grandicollis, Mann. *Truro; Penzance (Marquand)*
 — lata, Mots.
 — fascicularis, Herbst
 — sericans, Heer. *Penzance district (Marquand)*
 — bovina, Mots.
 — montandonii, All. *Ludgvan*
 Nephanea titan, Newm. *About farmyards*
 Ptilium exaratum, All.
 — foveolatum, All.

TRICHOPTERYGIDAE (*cont.*)

- Actidium coarctatum, Hal. *Under stones on trampled droppings by a tiny stream at Grampond*
 Ptenidium punctatum, Gyll. S.
 — nitidum, Heer
 — evanescens, Marsh. S.

CORYLOPHIDAE

- Orthoperus kluki, Wank.
 — brunnipes, Gyll.
 — atomus, Gyll.
 — atomarius, Heer
 Corylophus cassidioides, Marsh.

COCCINELLIDAE

- Subcoccinella 24-punctata, L.
 Anisosticta 19-punctata, L.
 Adalia obliterata, L. *In fir plantations*
 — bipunctata, L. *Remarkably scarce*
 Mysia oblongoguttata, L. *Liskeard*
 Anatis ocellata, L.
 Coccinella 10-punctata, L.
 — hieroglyphica, L.
 — 11-punctata, L. S.
 — 7-punctata, L. S.
 Halysia 16-guttata, L.
 — 14-guttata, L.
 — 18-guttata, L.
 — conglobata, L.
 — 22-punctata, L.
 Micraspis 16-punctata, L.
 Hyperaspis reppensis, Herbst
 Scymnus pygmaeus, Fourc. *Whitsand Bay; Gerrans*
 — frontalis, F.
 — suturalis, Thunb.
 — lividus, Bold. *One taken by J. J. Walker in Whitsand Bay in the summer of 1875 is the only example known in addition to the type*
 — haemorrhoidalis, Herbst
 — capitatus, F. *One specimen at Whitsand Bay (Keys)*
 — minimus, Rossi. *One specimen found floating on a rock pool near Rame Hd. 1901 (Keys)*
 Platynaspis luteorubra, Goeze
 Chilocorus bipustulatus, Ill.
 Exochomus quadripustulatus, L.
 Rhizobius litura, F. S.
 Coccidula rufa, Herbst
 — scutellata, Herbst. *Penzance district (Marquand)*

ENDOMYCHIDAE

- Mycetaea hirta, Marsh.
 Alexia pilifera, Müll.
 Lycoperdina bovistae, F.

INSECTS

EROTYLIDAE

- Dacne humeralis*, F.
Triplax russica, L.
Cyrtotriplax bipustulata, F. *Truro*

PHALACRIDAE

- Phalacrus corruscus*, Payk.
 — *caricis*, Sturm
Olibrus corticalis, Panz.
 — *aeneus*, F. S.
 — *liquidus*, Br. Cat. At roots, *Whitsand Bay* and *Downderry* (Keys)
 — *particeps*, Muls. Some number by sweeping at *Whitsand Bay*, Sept. 1895 (Keys)
 — *millefolii*, Payk.
Eustilbus testaceus, Panz. S.

MICROPEPLIDAE

- Micropeplus porcatus*, Payk.
 — *staphylinoides*, Marsh.
 — *margaritae*, Duv.

NITIDULIDAE

- Brachypterus pubescens*, Er.
 — *urticae*, F.
Cercus pedicularius, L. Scarce in *S.E. Cornwall*
 — *bipustulatus*, Payk. Once on *Spiraea ulmaria*, *St. Germans*
 — *ruflabris*, Latr.
Carpophilus hemipterus, L.
Epuraea aestiva, L.
 — *melina*, Er. Two specimens only at *Penzance*
 — *florea*, Er.
 — *deieta*, Er.
 — *obsoleta*, F. *Penzance* (Marquand)
 — *pusilla*, Er. Very scarce under bark, *Bishop's Wood, Truro*
Omosiphora limbata, F.
Nitidula bipustulata, L.
 — *rufipes*, L. One on the dead body of a greenfinch at *Trerice, Newquay*
 — *quadripustulata*, F. *Launceston* (Peter)
Soronia grisea, L.
Omosita colon, L.
 — *discoidea*, F.
Pocadius ferrugineus, F.
Pria dulcamarae, Scop. *Mount Edgcombe*
Meligethes rufipes, Gyll.
 — *fulvipes*, Bris.
 — *aeneus*, F.
 — *viridescens*, F.
 — *memnonius*, Er.
 — *pedicularius*, Gyll.
 — *maurus*, Sturm
 — *ovatus*, Sturm. *Whitsand Bay* (Keys); on sandy knolls, *Portscatho*
 — *picipes*, Sturm. S.

NITIDULIDAE (continued)

- Meligethes murinus*, Er. *Whitsand Bay* (Keys)
 — *lugubris*, Sturm. *Whitsand Bay*
 — *obscurus*, Er.
 — *erythropus*, Gyll.
 — *exilis*, Sturm. Found by Walker at *Whitsand Bay* and taken there lately in some numbers by Keys
Cychramus luteus, F.
Cryptarcha strigata, F. Widespread but very scarce
 — *imperialis*, F. *Penzance* district
Ips quadriguttata, F.

TROGOSITIDAE

- Tenebrioides mauritanicus*, L.
Truro

COLYDIIDAE

- Orthocerus muticus*, L.
Cerylon histeroideus, F.

CUCUJIDAE

- Rhizophagus cribratus*, Gyll. *Mount Edgcombe*; scarce under bark at *Bishop's Wood, Truro*; *Penzance* district
 — *depressus*, F.
 — *perforatus*, Er.
 — *parallelocollis*, Er. One specimen, *Launceston* (Peter)
 — *ferrugineus*, Payk. *Gunnislake*, under pine bark (Keys); *Penzance*
 — *bipustulatus*, F.
Laemophloeus pusillus, Schön.
 Three from *S. E. Cornwall*
 — *ferrugineus*, Steph.
Psammoechus bipunctatus, F.
Nausibius dentatus, Marsh. *Falmouth*
Silvanus surinamensis, L.

MONOTOMIDAE

- Monotoma conicicollis*, Aubé.
Bishop's Wood, Truro
 — *picipes*, Herbst. *Launceston* (Peter)
 — *quadricollis*, Aubé

LATHRIDIIDAE

- Lathridius lardarius*, De Geer
 — *angulatus*, Humm.
Coninomus nodifer, Westw.
Enicmus minutus, L.
 — *transversus*, Ol.
 — *rugosus*, Herbst. Found by Marquand close to *Penzance* in 1880; three stray specimens found there in 1901.

LATHRIDIIDAE (continued)

- Cartodere ruficollis*, Marsh.
 — *elongata*, Curt. Near *Launceston*
Corticaria pubescens, Gyll.
 — *crenulata*, Gyll.
 — *denticulata*, Gyll.
 — *serrata*, Payk. *Land's End* (Isabell)
 — *fulva*, Com.
 — *elongata*, Humm.
Melanophthalma gibbosa, Herbst. S.
 — *transversalis*, var. *wollastoni*, Wat. *Carbis Bay*
 — *fuscata*, Humm.
 — *fulvipes*, Com. *St. Mary's and Treco, Scilly*

CRYPTOPHAGIDAE

- Diphyllus lunatus*, F. *Fowey* (Fowler)
Telmatophilus caricis, Ol.
 — *typhae*, Fall. *Marazion*
Antherophagus nigricornis, F.
 — *pallens*, Gyll.
 — *silaceus*, Herbst. Obtained by J. J. Walker at *Whitsand Bay*
Cryptophagus lycoperdi, Herbst
 — *setulosus*, Sturm
 — *pilosus*, Gyll. *Penzance* district (Marquand)
 — *ruficornis*, Steph. Was found by Wollaston at *Mount Edgcombe*. Keys took a specimen out of an old ash tree at *Millbrook* in March, 1895
 — *saginitus*, Sturm
 — *scanicus*, L.
 — *dentatus*, Herbst
 — *distinguendus*, Sturm. One specimen, *Launceston* (Peter)
 — *acutangulus*, Gyll.
 — *cellaris*, Scop.
 — *affinis*, Sturm
 — *pubescens*, Sturm. Valley of the *Lynher*
Micrambe vini, Panz. S.
Paramecosoma melanocephalum, Herbst
Atomaria nigriventris, Steph.
 — *umbrina*, Er.
 — *linearis*, Steph.
 — *elongatula*, Er. *Cornwall* (Fowler)
 — *fuscata*, Schön.
 — *pusilla*, Payk.
 — *atricapilla*, Steph.
 — *mesomelas*, Herbst
 — *analisis*, Er.
 — *versicolor*, Er. *Launceston* (Fowler)
Ephistemus gyrimoides, Marsh.
 var. *globulus*, Payk. Reported from *Penzance* by Marquand

A HISTORY OF CORNWALL

MYCETOPHAGIDAE

- Typhaea fumata*, L.
Trypophyllus punctatus, F.
Litargus bifasciatus, F. *Newquay*
Mycetophagus quadripustulatus, L.
 One specimen in collection
 from *Liskeard*
 — *piceus*, F.
 — *atomarius*, F.
 — *quadriguttatus*, Müll. *Valley*
 of the *Lynher*
 — *multipunctatus*, Hellw.

BYTURIDAE

- Byturus sambuci*, Scop.
 — *tomentosus*, F.

DERMESTIDAE

- Dermestes vulpinus*, F.
 — *murinus*, L.
 — *undulatus*, Brahm. *Loe Pool*
 — *lardarius*, L.
Attagenus pello, L.
Megatoma undata, Er. *Truro*
Tiresias serra, F. *Launceston* (Peter)
Anthrenus varius, F. *Newquay*
 — *musaeorum*, L. *Truro*
 — *claviger*, Er.

BYRRHIDAE

- Syncalypta hirsuta*, Sharp
Byrrhus pilula, L.
 — *fasciatus*, F. On hills, very
 local but widespread
 — *dorsalis*, F.
 — *murinus*, F.
Cytilus varius, F. Above *Tre-*
bartha; *Penzance* district
Simplocaria semistriata, F. S.
Limnichus pygmaeus, Sturm. This
 semi-aquatic species has been
 taken lately near *Padstow*

GEORYSSIDAE

- Georyssus pygmaeus*, F.

PARNIDAE

- Elmis aeneus*, Müll.
 — *volkmari*, Panz. Banks of
Camel; *Land's End* (Isabell)
 — *parallelopipedus*, Müll. River
Inney
 — *subviolaceus*, Müll.
 — *cupreus*, Müll. Occasionally
 taken in profusion among
 submerged mosses in stony
 streams of the *Land's End*
 district
Limnius tuberculatus, Müll. *Land's*
End district (Isabell)
 — *trogodytes*, Gyll. *Land's End*
 district (Baily)

PARMIDAE (continued)

- Parnus prolifericornis*, F.
 — *auriculatus*, Panz.

HETEROCERIDAE

- Heterocerus marginatus*, F. *Swan-*
pool
 — *obsoletus*, Curt. *Padstow*

LUCANIDAE

- Lucanus cervus*, L. The stag
 beetle. Apparently only a
 casual in the south-east of
 the county, as two single
 specimens from *Mount Edg-*
cumbe and one reported by
 Keys from *Saltash* are the
 only records
Dorcus parallelopipedus, L.
Sinodendron cylindricum, L.

SCARABAEIDAE

- Onthophagus ovatus*, L.
 — *coenobita*, Herbst
 — *vacca*, L.
 — *fracticornis*, Payk. On sand-
 hills near *Perranporth*; *Pen-*
zance district; *St. Martin's*,
Scilly (Champion)
 — *nuchicornis*, L. S.
Aphodius erraticus, L. S.
 — *subterraneus*, L.
 — *fossor*, L. S.
 — *haemorrhoidalis*, L.
 — *foetens*, F. About *Land's End*
 in the first week of October;
St. Mary's, Scilly (Champion)
 — *finetarius*, L. S.
 — *scybalarius*, F. S.
 — *ater*, De G.
 — *constans*, Duft.
 — *granarius*, L.
 — *nitidulus*, F. Abundant, *Whit-*
sand Bay east; common, *St.*
Mary's, Scilly
 — *sturni*, Harold. A single ex-
 ample of this species new to
 the *British Isles* was taken
 by Keys at *Whitsand Bay* in
 1902. It was identified by
 Herr Bourkill and confirm-
 ed by Herr Reitter (*Ent.*
Record, 1903, p. 92)

- *sordidus*, F.
 — *rufescens*, F. S.
 — *porcus*, F.
 — *scrofa*, F. Recorded by Steph-
 ens from *Pentire Pt., Padstow*,
 but has not been captured
 in the county since his time
 — *tristis*, Panz.
 — *pusillus*, Herbst. *Land's End*
 — *merdarius*, F. S.
 — *inquinatus*, F.
 — *tessulatus*, Payk.
 — *sticticus*, Panz.
 — *punctato-sulcatus*, Stm. S.
 — *prodromus*, Brahm

SCARABAEIDAE (continued)

- Aphodius contaminatus*, Herbst
 — *obliteratus*, Panz. *Penzance*
 district (Marquand)
 — *luridus*, F. Rame (Keys)
 — *rufipes*, L.
 — *depressus*, Kug.
Heptaulacus sus, Herbst. *Altarnun*
Oxyomus porcatus, F.
Psammobius caesus, Panz. Two or
 three were found on *Tresco*,
Scilly, by C. W. Dale in
 October, 1890. A very
 unexpected locality
 — *sulcicollis*, Ill. *Padstow*
 — *porcicollis*, Ill. A few speci-
 mens of this rare and re-
 markably local species were
 found by J. J. Walker at
Whitsand Bay, and it has
 been frequently taken there
 of late years by Keys, who
 writes 'I find it in sandy places
 under stones on the cliffs
 and at roots. It is so ex-
 tremely sluggish in its move-
 ments that it hardly seems
 likely to become distributed.
 Possibly the beetle is a root
 feeder, as I once took twenty
 several inches down in the
 soil'
Aegialia arenaria, F. S.
Geotrupes typhoeus, L. S.
 — *spiniger*, Marsh. S.
 — *stercorarius*, L.
 — *mutator*, Marsh. S.
 — *sylvaticus*, Panz. S.
 — *vernalis*, L. *Land's End*; *St.*
Mary's, Scilly
Trox sabulosus, L.
 — *scaber*, L. One between *Per-*
ranporth and *Newquay*
Hoplia philanthus Füss. *Cornwall*
 (Fowler)
Serica brunnea, L. S.
Rhizotrogus solstitialis, L. S.
 Though the larvae of this
 species are not usually accused
 of doing much injury to farm
 crops in England they have
 from time to time done a
 considerable amount of local
 damage in *Cornwall*. In
 1890 and 1891 they did a
 great deal of harm to the
 crops of dredge corn about
Perranporth, and in 1901
 did conspicuous mischief in
 oats and dredge corn about
Truro. They were noticed
 in abundance in fields about
Bodmin some years ago, but
 as almost all injury to farm
 crops from soil-larvae is attri-
 buted to wireworm it is at
 present difficult to estimate
 the total amount of damage
 done by any particular species.

INSECTS

SCARABAEIDAE (*continued*)

Rhizotrogus ochraceus, Knoch. Taken by Lamb on the north coast of *Cornwall* in 1902 and again in 1903. Previous to that time it had been represented in British collections only by two or three specimens.

Melolontha vulgaris, F. The common cockchafer is a serious farm and garden pest throughout the county in the larval stage, attacking more especially spring corn, grass and strawberries, but occasionally doing mischief to swedes, mangels, potatoes, kitchen garden produce and herbaceous borders. By removing the bark in patches the insect itself does damage at times to young trees, but more especially to larch, spruce, and *Pinus insignis*.

Phyllopertha horticola, L. In the larval stage this insect is destructive to grass, dredge corn, and young seeds, particularly in the middle of the county, and the mature insect does frequent damage to the leafage of fruit trees and to roses. A few years ago a long velvety-black grub was found in the school gardens attacking the larva of *P. horticola* just behind the head and steadily devouring it. By good fortune the grub was hatched out in a breeding cage and proved to be *Telephorus bicolor*. S.

Anomala frischii, F. Two specimens taken between *Perranporth* and *Newquay*; reported from *Looe*.

Cetonia aurata, L. Fairly frequent on high land near the sea in the *Land's End* and *Lizard* peninsula; *St. Mary's*, *Scilly*.

BUPRESTIDAE

Aphanisticus pusillus, Ol. Reported by Thomas from *Looe*.

THROSCIDAE

Throscus dermestoides, L.

ELATERIDAE

Lacon murinus, L.

Cryptohypnus riparius, F.

— *quadripustulatus*, F. On the right bank of the *Fowey* about half a mile above *Lostwithiel*.

ELATERIDAE (*continued*)

Elater balteatus, L.

Athous niger, L.

— *longicollis*, Ol. *Camelford*; *Penzance*.

— *haemorrhoidalis*, F. Did serious damage to the oats of the *Penzance* district in 1902.

— *vittatus*, F.

Limonius cylindricus, Payk.

— *minutus*, L.

Sericosomus brunneus, L. Very scarce in the *Land's End* district.

Adrastus limbatus, F.

Agriotes sputator, L. S.

— *obscurus*, L.

— *lineatus*, L. S.

— *sobrinus*, Kies.

— *pallidulus*, Ill. S.

The larvae of *Agriotes sputator*, *A. obscurus*, and *A. lineatus*, collectively known as the wireworm, do an enormous amount of damage annually in every district, but especially about *Liskeard*. These hard, smooth, tough, shining, reddish or yellowish-brown, slender cylindrical larvae are by far the most destructive pests in the county both on field and on garden produce and there is practically no crop that escapes their attention. The long-period grass leys that are much in favour throughout the county are in part responsible for the prevalence of this insect. Firing the land usually limits the extent of its depredations, but there is no general effective remedy. Many birds, however, including the starling, rook, and various gulls, devour the wireworm in large numbers, and special means can be occasionally devised for giving them an opportunity of clearing the land of this disastrous pest.

Dolopius marginatus, L.

Corymbites cupreus, F. Taken in 1902 by E. C. H. Davies, near *Padstow*, and by A. G. Peter, near *Launceston*.

— *tessellatus*, F.

— *quercus*, Gyll.

— *holosericeus*, F. *Altarnun*; on the moors above *Liskeard*; *St. Mary's*, *Scilly*.

— *aeneus*, L. *Altarnun*; *Camelford*.

Campylus linearis, L.

DASCILLIDAE

Dascillus cervinus, L.

Helodes minuta, L.

— *marginata*, F.

DASCILLIDAE (*continued*)

Microcara livida, F.

Cyphon coarctatus, Payk.

— *nitidulus*, Thoms.

— *variabilis*, Thunb. S.

— *pallidulus*, Boh.

— *padi*, L. *Penzance* district (*Marquand*).

Scirtes hemisphaericus, L. Marshy ground, *Downderry* (*Keys*); *Bishop's Wood*, *Truro*.

MALACODERMIDAE

Lampyrus noctiluca, L.

Podabrus alpinus, Payk.

Telephorus rusticus, Fall.

— *lividus*, L.

— *pellucidus*, F.

— *nigricans*, Müll.

— *bicolor*, F.

— *oralis*, Germ.

— *flavilabris*, Fall.

Rhagonycha unicolor, Curt. Scarce in the valley of the *Lynher*; *Marazion*.

— *fulva*, Scop.

— *testacea*, L.

— *limbata*, Thoms.

— *pallida*, F.

Malthinus punctatus, Fourc.

— *fasciatus*, Ol.

— *balteatus*, Suff.

— *frontalis*, Marsh.

Malthodes marginatus, Latr.

— *dispar*, Germ.

— *minimus*, L.

— *atomus*, Thoms. *Millook*.

Malachius aeneus, L. *Par*.

— *bipustulatus*, L.

— *marginellus*, Ol.

Anthocomus fasciatus, L.

Dasytes flavipes, F. S.

— *aerosus*, Kies.

Psilothrix nobilis, Ill. On dandelions just above high-water mark, *Newquay*.

Dolichosoma lineare, Rossi.

CLERIDAE

Tillus elongatus, L. *Liskeard*.

Necrobia ruficollis, F.

— *violacea*, L.

— *rufipes*, De G.

PTINIDAE

Ptinus sexpunctatus, Panz. *Looe*.

— *fur*, L.

Niptus hololeucus, Fald.

— *crenatus*, F. *Land's End* (*Isabell*).

Hedobia imperialis, L.

Priobium castaneum, F. Dead ash, *Rame*; decaying elm, *Truro*.

A HISTORY OF CORNWALL

PTINIDAE (*continued*)

Anobium denticolle, Panz.
— domesticum, Fourc.
— paniceum, L. *Falmouth*
Xestobium tessellatum, F.
Ernobius mollis, L.
Ptilinus pectinicornis, L. S.
Ochina hederæ

BOSTRICHIDAE

Rhizopertha pusilla, F.

LYCTIDAE

Lyctus canaliculatus, F.

CISSIDAE

Cis boleti, Scop.
— villosulus, Marsh.
— micans, F. *Liskeard*; *Looe*
— hispidus, Payk.
— bidentatus, Ol. *Stratton*
— alni, Gyll. *Mount Edgcumbe*
park (Fowler)
— nitidus, Herbst. *Millbrook*
(Keys)
— festivus, Panz. *Saltsb*
Octotemnus glabriculus, Gyll.

CERAMBYCIDAE

Prionus coriarius, L. Scarce about
Kilkhampton; one specimen
Millook
Aromia moschata, L.
Callidium violaceum, L. Valley of
the *Lynher*
Clytus arietis, L.
Gracilia minuta, F.
Rhagium inquisitor, F.
— bifasciatum, F.
Toxotus meridianus, Panz.
Pachyta cerambyciformis, Schr.
Valley of the *Lynher*
— collaris, L. *Liskeard*
Leptura fulva, De G. A fine speci-
men taken by Thomas at
Looe in 1902
— livida, F.
Strangalia quadrifasciata, L. *Looe*
valley (Thomas)
— armata, Herbst
— nigra, L.
— melanura, L.
Grammoptera tabacicolor, De G.
— ruficornis, F.
Acanthocinus aedilis, L. Six
specimens altogether have
been obtained in timber
yards at *Truro*; probably
imported
Leiopus nebulosus, L. A few sin-
gle specimens on oak trees
in the *Coombe* valley, *Kilk-*
hampton
Pogonochaerus bidentatus, Thoms.
Penzance district (Marquand)

CERAMBYCIDAE (*continued*)

Monochammus sartor, F. Three
in timber yard at *Truro*;
probably imported
— sutor, L. *Penzance* in washed-
up timber
Tetrops praeusta, L.
Phytoecia cylindrica, L.

BRUCHIDAE

Bruchus cisti, F.
— pisi, L.
— rufimanus, Boh.
— atomarius, L.
— loti, Payk.
The pea weevil B. pisi and the
bean weevil B. rufimanus are oc-
casionally common, but as nei-
ther crop is largely grown in the county
they have so far done but little
harm

CHRYSOMELIDAE

EUPODA

Donacia dentata, Hoppe. Round
the head of *Mount's Bay*
— dentipes, F.
— limbata, Panz.
— bicolora, Zsch.
— simplex, F. The larvae of this
insect in 1903 and 1904
destroyed a number of leaves
of the Arum lily at *Scilly*
by eating inside the petiole.
— semicuprea, Panz. On Nym-
phaea alba on the Goss
moors
— sericea, L.
— discolor, Panz. On the moors
above *Liskeard*
— affinis, Kunze
Lema cyanella, L. *Tregantle*
(Keys); *Gerrans Bay*; *Pen-*
zance
— lichenis, Voet. *Gunnislake*
(Keys).
— melanopa, L.
Crioceris asparagi, L. The as-
paragus beetle. This has
frequently appeared on as-
paragus in the county during
the past five years, but not
so far in such numbers as to
cause alarm; has been found
on the moors at *Altarnun*

CAMPTOSOMATA

Clythra quadripunctata, L.
Cryptocephalus aureolus, Suffr.
One specimen *Whitsand Bay*
(Bignell)
— hypochaeridis, L. *Looe*.
— fulvus, Goeze. *Whitsand Bay*;
Falmouth; *St. Mary's, Scilly*
— pusillus, F.
— labiatus, L.

CHRYSOMELIDAE (*continued*)

CYCLICA

Lamprosoma concolor, Sturm.
Whitsand Bay (Keys); *Gerr-*
ans Bay; *Falmouth*; *Pen-*
zance
Timarcha tenebricosa, F.
— violaceo-nigra, De G.
Chrysomela banksi, F. *Millook*;
Whitsand Bay (Keys); *Pad-*
stow (Lamb); *Falmouth*;
Penzance
— staphylea, L.
— polita, L.
— orichalcia, Müll.
— haemoptera, L. *Whitsand Bay*;
Gerran's Bay; in great pro-
fusion some years, *Penzance*;
Newquay; *Mawgan-in-*
Pydar; *Padstow* (Lamb)
— varians, Schall. Around *Mount's*
Bay
— goettingensis, L. *Rame Hd.*
(Keys)
— fastuosa, Scop. *Altarnun*; *Lis-*
keard; *Penzance*
— didymata, Scriba.
— hyperici, Först.
Melasoma aeneum, L. *Liskeard*
— populi, L.
Phytodecta olivacea, Först.
var. litura, F. *Penryn*;
Penzance
Gastroidea viridula, De G.
— polygona, L.
Phaedon tumidulus, Germ.
— armoraciae, L. This appeared
in quantity for the first time
of recent years in 1902,
when it caused much damage
to cabbage and turnip crops
in the south-east of the
county. It has not been re-
ported since
— cochleariae, F.
Phyllodecta vulgatissima, L.
— cavifrons, Thoms.
— vitellinae, L.
Hydrothassa aucta, F.
— marginella, L.
Prasocuris junci, Brahm
— phellandrii, L.
Phyllobrotica quadrimaculata, L.
Valley of the *Lynher*
Luperus nigrofasciatus, Goeze
— rufipes, Scop.
— flavipes, L.
Lochmaea capreae, L.
— suturalis, Thoms.
— crataegi, Först.
Galerucella nymphaeae, L. On
buckwheats at *Nance, Truro*,
1903
— sagittariae, Gyll.
— lineola, F.
— calmariensis, L.
— tenella, L.
Adimonia tanacetii, L. *Gerran's*
Bay; *Land's End* (Isabell)

INSECTS

CHRYSOMELIDAE (continued)

CYCLICA (continued)

- Sermyla halensis*, L.
Longitarsus holsaticus, L.
 — *luridus*, Scop.
 — *brunneus*, Duft.
 — *sutrellus*, Duft.
 — *atricillus*, L.
 — *melanocephalus*, All.
 — *atriceps*, Kuts.
 — *suturalis*, Marsh. Taken by Isabell near *Sennen*
 — *membranaceus*, Foudr. *Tintagel*
 — *waterhousei*, Kuts. Reported by Marquand from the neighbourhood of *Penzance*
 — *flavicornis*, Steph.
 — *femoralis*, Marsh. S.
 — *pusillus*, Gyll.
 — *tabidus*, F.
 — *jacobaeae*, Wat. S.
 — *rutilus*, Ill. *Padstow* (Lamb)
 — *ochroleucus*, Marsh.
 — *gracilis*, Kuts.
 — *laevis*, Duft.
Haltica lythri, Aubé
 — *oleracea*, L.
 — *pusilla*, Duft.
Hermaeophaga mercurialis, F. *Kilkhampton*
Phyllotreta nodicornis, Marsh. Two specimens taken by Thomas near *Looe* in 1904
 — *nigripes*, F.
 — *consobrina*, Curt. *Whitsand Bay*; *West Cornwall*, scarce
 — *punctulata*, Marsh.
 — *atra*, Payk. *Looe*; *Padstow* (Lamb); *St. Mary's, Scilly*
 — *vittula*, Redt. S.
 — *undulata*, Kuts. S.
 — *memorum*, L. S.
 — *ochripes*, Curt.
 — *exclamationis*, Thunb.

This genus, under the name of turnip fly, is only too well known throughout the county, as it at times works serious havoc on the turnip crop while still in the smooth leaf or cotyledon stage. *P. nemorum* is the dominant species, but in 1902 several fields about *St. Columb* were badly attacked by *P. undulata*. In the spring of 1903 the foliage of the early potatoes at *St. Mary's, Scilly*, was injured by *P. atra*. A few years ago a field of dredge corn near *St. Agnes* was practically smothered with charlock, but about the beginning of June *P. vittula* was noticed in great numbers on the weed, and in a fortnight every visible charlock leaf was completely riddled.

- Aphthona lutescens*, Gyll. *Newquay*
 — *nonstriata*, Goeze. *Padstow* (Lamb); *Newquay*

CHRYSOMELIDAE (continued)

CYCLICA (continued)

- Aphthona venustula*, Kuts.
 — *atrocoerulea*, Steph.
 — *virescens*, Foudr. In some number near *Liskeard* in 1904
Batophila rubi, Payk.
 — *aerata*, Marsh.
Sphaeroderma testaceum, F. S.
 — *cardui*, Gyll.
Apteropeda orbiculata, Marsh.
 — *globosa*, Ill. *Penzance* district (Marquand)
Mniophila muscorum, Koch.
Podagrica fuscipes, L.
 — *fuscicornis*, L.
Mantura rustica, L.
Crepidoderat ransversa, Marsh.
 — *ferruginea*, Scop.
 — *rufipes*, L.
 — *ventralis*, Ill.
 — *helxines*, L.
 — *chloris*, Foudr.
 — *aurata*, Marsh.
 — *smaragdina*, Foudr.
Hippuriphila modeeri, L.
Chaetoncema hortensis, Fourc.
Plectroscelis concinna, Marsh. The brassy turnip flea. It is often common in different parts of the county, but so far as known has not committed any serious depredations since systematic observations began seven years ago
Psylliodes chrysocephala, L. *Tregantle*
 var. *nigricollis*, Marsh. One specimen *Tregantle* (Keys)
 — *napi*, Koch. S.
 — *cuprea*, Koch.
 — *affinis*, Payk.
 — *marcida*, Ill. Abundant at times under cakile, *Tregantle* (Keys); *Newquay*; *Scilly*
 — *chalcomera*, Ill. *Tregantle*; *Looe*
 — *hyoscyami*, L. *Trevaylor valley*; *Penzance* (Marquand)

CRYPTOSOMATA

- Cassida murraea*, L. *Millook*; banks of the *Linney*
 — *vibex*, F.
 — *vittata*, Vill.
 — *nobilis*, L. *Mount Edgcombe*; *Tregantle* (Keys); on scurvy grass, *Newquay*
 — *flaveola*, Thunb. *Whitsand Bay* (Keys); *Gerrans Bay*; *Penzance*
 — *equestris*, F. On marshy ground, *Downderry* (Keys); common on mint at *Little Canaan, Truro*; fairly plentiful round the head of *Mount's Bay*
 — *viridis*, F.

CHRYSOMELIDAE (continued)

CRYPTOSOMATA (continued)

- Cassida hemisphaerica*, Herbst. One specimen *Marazion*; one specimen among the fresh-water pools at *Land's End*

TENEBRIONIDAE

- Blaps mucronata*, Latr.
Crypticus quisquilius, L. Occurs at *St. Mary's, Treco*, and *St. Agnes, Scilly*
Heliopathes gibbus, F. Abundant in sandy places throughout the county, but evidently very local; occurs at *Scilly*
Opatrum sabulosum, Gyll.
Microzoum tibiale, F. On the sand hills at *Bude*; *Looe* (Thomas)
Phaleria cadaverina, F. Fine specimens, some almost black, have been taken by Keys at *Tregantle*; *St. Mary's, Scilly*
Scaphidema metallicum, F. In decaying branch of elm, *Tregothnan*
Tenebrio molitor, L.
 — *obscurus*, F.
Alphitobius piceus, Ol. *Falmouth*
Gnathocerus cornutus, F. *Penzance*
Tribolium ferrugineum, F.
 — *confusum*, Duv.
Palorus melinus, Herbst
Helops striatus, Fourc. S.

CISTELIDAE

- Cistela murina*, L.
Cteniopus sulphureus, L. Plentiful in the *Lizard* district and about *Hayle* on flowers of *Umbelliferae*; *Penzance*; *Land's End* (Isabell)

LAGRIIDAE

- Lagria hirta*, L. S.

MELANDRYIDAE

- Tetratoma fungorum*, F. Two in a rotten branch of beech near *Truro*
Orchesia micans, Panz. One from *Polyporus* at *Doublebois*
Melandrya caraboides, L. About thirty in a decayed apple tree at *St. Columb*

PYTHIDAE

- Salpingus castaneus*, Panz.
 — *aeratus*, Müll.
Rhinosimus viridipennis, Steph.
 — *planirostris*, F.

A HISTORY OF CORNWALL

OEDEMERIDAE

- Oedemera nobilis*, Scop.
— *lurida*, Marsh.
Oncomera femorata, F. In some numbers when sugaring at *Truro*, April, 1900
Nacerdes melanura, Schmidt
Ischnomera coerulea, L.

PYROCHROIDAE

- Pyrochroa serraticornis*, Scop.

MORDELLIDAE

- Mordella fasciata*, F. *Launceston* (Peter)
Mordellistena pumila, Gyll. *Calington*
— *parvula* var. *inaequalis*, Muls. *Tregantle* (Keys)
Anaspis frontalis, L.
— *pulicaria*, Costa
— *ruflabris*, Gyll.
— *geoffroyi*, Müll. On white thorn, *Lostwithiel*
— *ruficollis*, F.
— *flava*, L. *Ludgvan*; *Trevaylor valley*, *Penzance*
var. *thoracica*, L. *Trevaylor valley*
— *subtestacea*, Steph.
— *maculata*, Fourc.

RHIPIDOPHORIDAE

- Metoecus paradoxus*, L.

ANTHICIDAE

- Notoxus monoceros*, L.
Anthicus humilis, Germ. Recorded from *Scilly* by F. Holmes
— *floralis*, L.
— *antherinus*, L.

XYLOPHILIDAE

- Xylophilus oculatus*, Gyll. Taken in decaying willow near *Doublebois* in 1905

MELOIDAE

- Meloe proscarabaeus*, L. S.
— *violaceus*, Marsh. *Whitsand Bay* (Keys); *Calstock*; valley of the *Lynher*
— *autumnalis*, Ol. Valley of the *Lynher*
— *rugosus*, Marsh. *Looe valley*
— *brevicollis*, Panz. *Saltash*; on the moors above *Liskeard*
Sitaris muralis, Först. *Truro*. This extremely interesting species has occurred sparingly for the past three years in a very restricted area not far from *Truro* about the nests of *Anthophora*. On 14 April, 1904, a female bee was caught with several of the early stage larvae of *Sitaris* attached to the body hairs

ANTHRIBIDAE

- Brachytarsus fasciatus*, Först.

CURCULIONIDAE

- Apoderus coryli*, L. In the *Kilkhampton* district
Attelabus curculionoides, L. *Millook*
Byctiscus populi, L. *Launceston* (Peter)
Rhynchites aeneovirens, Marsh. *Falmouth*; *Penzance* district (Marquand)
— *minutus*, Herbst. *Newquay*; *Penzance*
— *interpunctatus*, Steph. *Newquay*
— *nanus*, Payk.
— *pubescens*, F.
Deporatus betulae, L.
Apion pomonae, F.
— *cracca*, L. *Helston*
— *subulatum*, Kirby.
— *ulicis*, Först.
— *malvae*, F. Widespread but scarce
— *urticarium*, Herbst. *Launceston*
— *miniaturum*, Germ.
— *cruentatum*, Walt. Scarce in *E. Cornwall*
— *haematodes*, Kirby. S.
— *rubens*, Steph.
— *rufirostre*, F.
— *viciae*, Payk. *Tregantle* (Keys); *Boscattle*
— *difforme*, Germ. *Newquay*; *Perranporth*
— *varipes*, Germ. *Newquay*; *Penzance*
— *laevicollis*, Kirby. Though generally regarded as essentially of the south-eastern counties this insect has been taken by Keys at *Whitsand Bay*
— *apricans*, Herbst
— *bohemani*, Thoms. On rest-harrow, *Tregantle* (Keys); *Padstow*
— *trifolii*, L.
— *dichroum*, Bedel.
— *nigritarse*, Kirby. *Whitsand Bay*; *Boscattle*; *Penzance*
— *confluens*, Kirby. On *Matricaria*, *Whitsand Bay* (Keys)
— *hookeri*, Kirby. *Whitsand Bay*; *Looe*; *Gerran's Bay*
— *aeneum*, F.
— *radiolus*, Kirby
— *onopordi*, Kirby
— *carduorum*, Kirby. S.
— *atomarium*, Kirby. On thyme, *Tregantle* (Keys)
— *minimum*, Herbst. Round the head of *Mount's Bay*
— *virens*, Herbst
— *punctigerum*, Payk. *Boscattle*; *Newquay*

CURCULIONIDAE (continued)

- Apion pisi*, F. S.
— *aethiops*, Herbst
— *ebeninum*, Kirby
— *filirostre*, Kirby. *Looe*; *Padstow*
— *striatum*, Kirby
— *immune*, Kirby. *Bude*; *Gerran's Bay*; *Perranporth*
— *ononis*, Kirby
— *spencei*, Kirby
— *ervi*, Kirby
— *vorax*, Herbst
— *gyllenhali*, Kirby. *Tregantle* (Keys)
— *scutellare*, Kirby. Widespread in gorse, generally with *A. striatum*, but very scarce
— *waltoni*, Steph. *Whitsand Bay* (J. J. Walker)
— *loti*, Kirby. S.
— *seniculum*, Kirby
— *tenue*, Kirby
— *simile*, Kirby. *Gerran's Bay*; *Falmouth*
— *pubescens*, Kirby. *Padstow* (Lamb)
— *violaceum*, Kirby
— *hydrolapathi*, Kirby. S.
— *humile*, Germ.

The larvae of the genus *Apion* feed for the most part on seeds and seed-pods, more especially of the Leguminosae. In 1901 the attacks from *A. pomonae* on vetches in the east of the county were severe and not confined to the seed-pods, as in two cases the foliage also was badly eaten. From *Doublebois* to *Liskeard* scarcely a specimen of *Vicia sepium* by the roadside escaped their attention. In 1902 they again appeared in considerable numbers, but since 1903 the beetle has been scarce. *A. apricans* was very abundant from 1900 to 1902 about *Wadebridge*, and did considerable damage to the seeding clovers. In 1903 a plot of red clover at *Nanoe*, *Truro*, was badly attacked. Last year it was uncomfortably plentiful about *Liskeard*. *A. trifolii* and *A. virens* have both been hatched out of red clover pods, *A. dichroum* out of white, and *A. nigritarse* out of crimson (*Trifolium incarnatum*) and out of kidney vetch

- Otiorrhynchus tenebriosus*, Herbst
— *fuscipes*, Walt.
— *atroapterus*, De G. In moss and short grass at *Perranporth*; on brambles at *St. Ives*; *Penzance* district (Marquand); *St. Mary's* and *St. Martin's, Scilly*
— *blandus*, Gyll. Reported by *Isabell* from *Land's End*, but probably in error

INSECTS

CURCULIONIDAE (continued)

- Otiorrhynchus scabrosus, Marsh.
Whitsand Bay ; Liskeard
 — ligneus, Ol. S.
 — picipes, F.
 — sulcatus, F. S.
 — rugifrons, Gyll. Widespread. S.
 — ovatus, L. S.

The genus *Otiorrhynchus* frequently causes great damage in the garden, as the beetles feed on leaves, shoots, flowers and even fruit, while the larvae live on roots. *O. sulcatus* is very destructive to strawberries throughout the county, and is everywhere bad on neglected vines. Peaches, primulas, saxifrages, cyclamens, maidenheads, and begonias have all been damaged more or less throughout the county by this species during the last seven years. *O. picipes* attacks the apple, the gooseberry, and more especially the raspberry, and in 1878 did an enormous amount of damage to the raspberry canes about Gulval and Madron. *O. tenebriosus* infested some strawberry beds near Truro during 1903 and 1904, and if it spread will cause enormous loss throughout the county

- Trachyploeus squamulatus*, Ol. Obtained by Isabell in the *Land's End* district; one specimen taken near *St. Ives* in 1900
 — scaber, L.
 — scabriculus, L.
Caenopsis fissirostris, Walt. Valley of the *Lynher*
 — waltoni, Schön. *Whitsand Bay east*
Strophosomus coryli, F.
 — capitatus, De G.
 — retusus, Marsh. S.
 — faber, Herbst. Taken by J. J. Walker at *Whitsand Bay*
 — lateralis, Payk.
Exomias araneiformis, Schr.
 — pyrenaicus, Leidl. First discovered as a British insect by Keys in the *Plymouth* district; subsequently taken by Champion in Cornwall
Brachysomus echinatus, Bond. One specimen in *Bishop's Wood*, *Truro*, May, 1902
Sciaphilus muricatus, F.
Tropiphorus tomentosus, Marsh.
Barypeithes sulcifrons, Boh. *Mount Edgcombe* (Wollaston); at times frequent, *Whitsand Bay* (Keys)
Liophloeus nubilus, F.
Polydrusus tereticollis, De G.
 — pterygomalis, Boh.
 — cervinus, L.

CURCULIONIDAE (continued)

- Polydrusus chrysomela*, Ol. One from the *Gannel*, near *Newquay*
 — confluens, Steph. On broom near *Wadebridge*
Phyllobius oblongus, L.
 — calcaratus, F.
 — urticae, De G.
 — pyri, L.
 — argentatus, L.
 — maculicornis, Germ.
 — viridiaeris, Laich. *Lostwithiel ; Penzance*
Tanyinecus palliatus, F. S. *Petherwin*, among coarse herbage growing between large slabs of slate
Philopodon geminatus, F. S.
Barynotus obscurus, F.
 — elevatus, Marsh. On bracken, *Newquay*
Alophus triguttatus, F. Under stones and moss, *Hayle* and *Penzance*
Sitones griseus, F.
 — cambricus, Steph. *Penlee* (Keys); between *Mylor* and *Trefusis*, under cast-up larch-pole; *Scilly*
 — regensteiniensis, Herbst
 — waterhousei, Walt. *Whitsand Bay*
 — crinitus, Herbst
 — tibialis, Herbst
 — hispidulus, F.
 — humeralis, Steph.
 — flavescens, Marsh.
 — puncticollis, Steph. S.
 — suturalis, Steph.
 — lineatus, L. The clover weevil.
 In some years this does considerable damage to young seeds. In 1897, 1898, and 1899 it was abundant in almost every district in the county. In 1900 it was apparently nowhere common till the middle of July, and from that time till 1905 it was decidedly scarce. Last year it appeared in great numbers among clover near *Wadebridge* and caused extensive injury to peas about *Bodmin*
 — sulcifrons, Thunb.
Limobius dissimilis, Herbst. One taken last year on *Geranium sanguineum* near *Chapel-porth*, *St. Agnes*
 — hypera punctata, F. S.
 — fasciculata, Herbst. Three on *Erodium cicutarium* on the sand at *Perranporth*
 — rumicus, L.
 — pollux, F. *Marazion Marsh*
 — polygoni, L.
 — suspiciosa, Herbst. Widespread but scarce along the south coast

CURCULIONIDAE (continued)

- Limobius variabilis*, Herbst. *Padstow ; Truro ; Penzance ; St. Mary's, Scilly*
 — murina, F. *Hayle* and *Penzance*
 — plantaginis, De G. S.
 — trilineata, Marsh.
 — nigrirostris, F.
Rhinocyllus latirostris, Latr. Rare on thistles, *Penzance* district (Marquand)
Cleonus sulcirostris, L. *Padstow* (Lamb); *Perranporth*
Larinus carlinae, Ol. Obtained, 1905, near the *Lion's Den*, *Millook*
Liosoma ovatum, Clairv.
Liparus coronatus, Goeze. One at *Tregantle* (Keys); *Gerran's Bay ; Penzance* district (Marquand)
Hylobius abietis, L. At *Trebartha*; one near *Penzance* (Marquand)
Orchestes quercus, L.
 — alni, L.
 — ilicis, F. Two on oak, *Coombe Valley, Kilkhampton*
 — avellanae, Doh.
 — fagi, L.
 — rusci, Herbst
 — salicis, L.
 — saliceti, Payk. On young willows, *Hayle ; Penzance*
Rhamphus flavicornis, Clairv.
Orthocetes setiger, Beck. *Whitsand Bay east ; Penzance ; St. Mary's and Tresco, Scilly*
Erirrhinus acridulus, L.
Dorytomus tremulae, F. *Penzance* district (Marquand)
 — tortrix, L. Under poplar bark, *Truro*
 — maculatus, Marsh.
 — pectoralis, Gyll.
Smicronyx jungermanniae, Reich. One specimen by sweeping at *Tregantle* (Keys)
Tanysphyrus lemnae, F. *Swanpool ; Marazion Marsh*
Bagous alismatis, Marsh.
Anoplus plantaris, Naez. *Upper Tamar* district
Elleschus bipunctatus, L. *Trebartha*
Tychius schneideri, Herbst. *Whitsand Bay* and *Falmouth* (Fowler)
 — lineatulus, Steph.
 — junceus, Reich. *Mount Edgcombe*
 — tomentosus, Herbst. *Newquay*
Miccotrogus picirostris, F.
Sibinia arenariae, Steph.
 — primita, Herbst. S.E. Cornwall
Miarus micros, Germ. In vol. i of the *Entomologist*, p. 220, Crotch reports the capture of two specimens by Wollaston at *Whitsand Bay east*; still the only British record

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CURCULIONIDAE (continued)

- Gymnetron beccabungae*, F.
 — *pascuorum*, Gyll.
 — *antirrhini*, Payk.
Mecinus pyrae, Herbst
 — *circulatus*, Marsh.
Anthonomus ulmi, De G.
 — *rosinae*, Des Gozis
 — *pedicularius*, L.
 — *pomorum*, L. Though widely spread in the county this beetle has not hitherto caused serious damage to the fruit crops. It appeared in some quantity in the *St. Columb* district in 1901, and brown undeveloped flower-buds of the apple, occasionally with the little white wrinkled dark horny-headed grub inside, have been sent in from *Penzance*, *Bodmin* and *Boscawen*, and have been observed in numbers at *Callington* and *Newquay*
 — *rubi*, Herbst
Nanophyes lythri, F.
Cionus scrophulariae, L.
 — *tuberculosus*, Scop. One specimen by the *Gannel*
 — *blattariae*, F.
 — *pulchellus*, Herbst
Orobis cyaneus, L.
Cryptorrhynchus lapathi, L.
Acalles pinioides, Marsh.
 — *turbatus*, Boh. *Millbrook* (Keys)
Coeliodes rubicundus, Herbst. *Penzance* district (Marquand)
 — *quercus*, F.
 — *ruber*, Marsh.
 — *cardui*, Herbst
 — *quadrimaculatus*, L. S.
 — *exiguus*, Ol.
Poophagus sisymbrii, F.
 — *nasturtii*, Germ. Sparingly on the *Inney*, not far from *Altarnun*
Ceuthorrhynchus assimilis, Payk.
 — *syrites*, Germ. *Padstow* (Lamb)
 — *setosus*, Boh. *Whitsand Bay* (Fowler)
 — *constrictus*, Marsh. *Poundstock*
 — *cochleariae*, Gyll.
 — *ericae*, Gyll. S.
 — *erysimi*, F.
 — *contractus*, Marsh.
 — *quadridens*, Panz. S.
 — *geographicus*, Goeze. *Pencalnick*, *Truro*
 — *pollinarius*, Först
 — *pleurostigma*, Marsh. This beetle occasionally lays its eggs in considerable numbers on the roots of turnips, swedes, cabbages and broccoli, and the larvae on emerging cause local growth and the formation of unilocular

CURCULIONIDAE (continued)

- root galls rarely more than a half to three-quarters of an inch in diameter. A badly-infested swede from *Bodmin* carried no less than sixty-three, together with a few warty excrescences on the 'bulb.' The root crop is evidently not much affected by the presence of these galls, but young broccoli in the west of the county are occasionally ruined
Ceuthorrhynchus verrucatus, Gyll.
 Widespread but very local
 — *punctiger*, Gyll. One specimen at *Treganle* (Keys)
 — *marginatus*, Payk. One specimen, *Boscawen* (Keys)
 — *rugulosus*, Herbst. *Looe* valley
 — *melanostictus*, Marsh. *Marazion Marsh*; *Land's End* district
 — *chrysanthemi*, Germ. *Whitsand Bay* (Keys)
 — *litura*, F.
 — *trimaculatus*, F. *Whitsand Bay* (Fowler); *Padstow* (Lamb); *Newquay*
Ceuthorrhynchidius floralis, Payk.
 — *pyrrhorhynchus*, Marsh.
 — *nigrinus*, Marsh. *Looe* valley
 — *melanarius*, Steph.
 — *terminatus*, Herbst. *Land's End* (Isabell)
 — *horridus*, F. *Gerran's Bay*
 — *quercicola*, Payk. One specimen in the valley of the *Lynher*
 — *troglydites*, F. S.
 — *dawsoni*, Bris. Formerly abundant at *Whitsand Bay*, and still taken there by Keys
Rhinoncus pericarpus, L.
 — *gramineus*, Herbst
 — *perpendicularis*, Reich. One specimen, *Dowderry* (Keys)
 — *castor*, F. Widespread but very scarce
 — *bruchoides*, Herbst. *Truro*; *Falmouth*; *Penzance*
Litodactylus leucogaster, Marsh.
Phytobius waltoni, Boh. Around *Penzance*
 — *quadrituberculatus*, F. *Whitsand Bay* (Keys)
 — *canaliculatus*, Fabr.
Balaninus venosus, Grav.
 — *nucum*, L. Two specimens at *Liskeard*
 — *villosus*, F.
 — *salicivorus*, Payk.
 — *pyrrhoceras*, Marsh.
Magdalis armigera, Fourc.
 — *pruni*, L.
Calandra granaria, L.
 — *oryzae*, L.
Cossonus ferrugineus, Clairv. Valley of the *Lynher*

CURCULIONIDAE (continued)

- Rhopalomesites tardyi*, Curt. *Mount Edgumbe Park*; on an ash at *Millbrook* (Keys); near *St. Clement's*, *Truro*
Rhyncolus lignarius, Marsh.
Caulotrypis aeneopiceus, Boh. *Millbrook*; *Fowey*; *Falmouth*
Codiosoma spadix, Herbst. Old piles on the shore, *South Down* (Keys); *Falmouth*; in drift wood, *Trefusis*

SCOLYTIDAE

- Scolytus destructor*, Ol. This beetle often destroys the bark of felled elm in different parts of the county, and a fine series of old elms in *Tregolls Road*, *Truro*, were cut down in the winter of 1905-6 on account of the ravages committed for some years back by the repeated mining operations of this beetle and its larvae just under the bark
 — *rugulosus*, Ratz. This beetle appeared in considerable numbers in 1901 in some Lord Grosvenor apple trees near *Callington* that were badly cankered. Lately the beetle has been rather common about *Saltash*. As in the case of *S. destructor*, the female tunnels vertically between sapwood and bark, laying her eggs at short intervals, and the larvae when hatched continue burrowing and feeding at right angles to the parent gallery till they reach maturity
Hylastes ater, Payk. *Gunnislake*; *Penlee Woods* (Keys); *Bishop's Wood*, *Truro*; one from *College Wood*, *Penryn*
Hylastinus obscurus, Marsh.
Hylesinus crenatus, F.
 — *fraxini*, Panz.
 — *vittatus*, F.
Myelophilus piniperda, L.
Cissophagus hederæ, Schmidt. *Mount Edgumbe* (Keys); *Launceston*
Phloeophthorus rhododactylus, Marsh. *Marazion* (Baily)
Pityophthorus pubescens, Marsh.
Xylocleptes bispinus, Duft.
Dryocetes villosus, F.
Pityogenes bidentatus, Herbst
Trypodendron domesticum, L. *Mount Edgumbe*
Xyleborus dispar, F. In *Czar plum-tree*, *Launceston*.
Stylops melittæ, Kirby

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LEPIDOPTERA

The Lepidoptera of the county have always been a favourite study with the majority both of resident and of visiting entomologists, and the workers in consequence have been numerous. The earliest county lists are those of Dr. Cocks for Falmouth and of Mr. William Noye for Penzance. Mr. J. J. Reading, in his account of the Lepidoptera of the Plymouth district in the *Transactions of the Plymouth Institute* for 1861, included a number of valuable data from the south-east of the county. In 1882 Mr. E. P. Marquand published his 'Lepidoptera of West Cornwall' in the *Transactions of the Penzance Natural History and Antiquarian Society*, and between 1884 and 1890 further contributions appeared on the same subject and in the same *Transactions* by Mr. E. A. Atmore, Mr. A. H. Jenkin, Mr. H. W. Vivian, and Messrs. J. C. and C. W. Dale. The Lepidoptera of Scilly attracted the attention of Mr. R. Adkin, the Rev. H. Harpur Crewe, Mr. F. Jenkinson, and Mr. F. Norgate, while Mr. H. Jenner Fust published some interesting records for the mainland. Then in the *Transactions of the Penzance Natural History and Antiquarian Society* for 1894 Mr. W. E. Baily, in a paper entitled 'Lepidoptera of Cornwall and of the Islands of Scilly,' summed up practically all the work of previous writers, added many observations of his own, and incorporated the data supplied in MS. by the Rev. T. A. Marshall for East Cornwall, by Mr. R. V. Tellam for the country round Bodmin, and by the Messrs. Marquand for the Penzance district, along with some notes sent in by Mr. A. Rashleigh and Mr. F. Jenkinson.

In the preparation of the accompanying list the writer wishes to express his indebtedness to the late Mr. W. E. Baily and to the late Rev. T. A. Marshall for many unpublished county records, and to Mr. H. Goss for notes on north coast Lepidoptera. In addition to much admirable work by his pupils he further gratefully acknowledges annotated lists from the Rev. G. Lupton Allen for Millook and for Launceston; from Mr. A. Kenelm Peter for the country round Poundstock; from the late Mr. G. Marryat for Looe; from that prince of collectors, Mr. R. V. Tellam, for Mid-Cornwall; from his colleague Mr. W. A. Rollason for the Truro district; and from Mr. A. J. Spiller for Godolphin. Specimens and notes have also been kindly given to the writer or placed at his disposal by many county observers, chief among whom are Mr. J. D. Enys and Mr. Howard Fox.

The classification and arrangement of the moths is that of Mr. Edward Meyrick in his *Handbook of British Lepidoptera*.

RHOPALOCERA

The Swallow-tail (*Papilio machaon*) is not a native, but various attempts have been made to establish it in the county. Noye, Baily, and others have at different times set freshly-emerged specimens at liberty, and turned down pupae, but in all cases the insects have quickly disappeared. On 5 August, 1905, Howard Fox saw one crossing Trebah beach on the Helford River, probably a specimen accidentally introduced. Sir Charles Lemon reported an example of *Parnassius apollo* captured near one of his greenhouses at Carclew, but suggested it had been introduced in the pupa stage in a batch of plants from the Continent. Of the Black-veined White (*Aporia crataegi*) two specimens were recorded by F. H. Davey from the Falmouth district. One of these, fresh but mutilated, was brought to him by the captor in 1892 from the valley of the Kennall, near Ponsanooth; the other, taken in the St. Mawes district, he found in a local collection in 1894.

The Large and Small Cabbage Whites (*Pieris brassicae* and *P. rapae*) are abundant throughout the county, and occasionally do considerable damage to the different members of the cabbage family. In 1899 some Honesty grown for the market near Penzance was much disfigured, and a quantity of seedling wallflowers practically destroyed, by *P. brassicae*. Early in September, 1891, an immense cloud of this species came in near the Lizard, and for the next day or two, hundreds of thousands of dead insects were washed up on the beach.

The Green-veined White (*P. napi*) is common on the whole, though in some districts it is rather scarce. It never occurs in such quantities as to be a serious pest, the only mischief attributed to it during the last six years being the partial destruction of a crop of watercress near Bodmin in 1900.

The beautiful Orange-tip (*Anthracis cardamines*) is usually very common, but for some years females have been unaccountably scarce. Though usually single-brooded, specimens of a second emergence were seen and captured by Baily on 28 August, 1897, at Marazion. The larvae feed on cruciferae, and especially on the seed pods. In 1900 it attacked the pods of some seeding broccoli at Penzance, and in 1902 did some damage to seeding Brompton Stocks at Liskeard.

The delicate Wood White (*Leucophasia sinapis*) is in most seasons not uncommon in the sheltered partly-wooded valley of Millook, near Bude, and in the adjoining copses. It was obtained near Launceston over forty years ago by Reading, and has been recently taken in that neighbourhood by

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Rollason and others. It occurs somewhat sparingly on the edge of woods round Bodmin. A single specimen at Doublebois in 1900 and one near Looe in 1902 are the only other trustworthy records to hand.

The Pale Clouded Yellow (*Colias hyale*) is variable in its occurrence, but is always rare, and many years may pass without a single specimen being recorded for the county. It was taken at Whitsand Bay east in 1857 and again in 1892, when several were captured at Saltash. One was captured that same year in the vale of the Kennal, near Ponsanooth, and several by Baily near St. Burian in the Land's End district. In 1900, the year of the great invasion in the eastern counties, it was taken near the mouth of the Seaton River and on Budock Bottoms. At least two have been taken in the Bude district, several about Lostwithiel, two at Falmouth, one at the Lizard, and one at Marazion.

The Clouded Yellow (*Colias edusa*) is in some years abundant, in others seldom seen, and has been recorded from almost every district in the county. In 1877 it was in some localities extraordinarily abundant. In 1892 it was much more widely spread, but evidently nowhere plentiful, at least west of Par. In 1897 it was very common about Godolphin, Spiller taking forty one morning on Praa Green. In 1899 it was again abundant on the clover fields about Godolphin, and in 1900 it occurred in great numbers from Truro westwards. Near Falmouth that year it literally swarmed during the last week of August and the first week of September. The female variety, *helice*, together with intermediate forms, occurred sparingly with the type, Rollason taking eleven specimens, all in perfect condition, freshly emerged, and on several occasions before their wings were perfectly dried, and yet in spite of careful search he failed to find any pupa cases either of this or of the type.

Writing in 1893, Baily says that the Brimstone (*Gonepteryx rhamni*) was plentiful in the east of the county, but grew rapidly scarce towards the west, and that it had never been found beyond Penzance. Nowadays it is not only common about Truro, but is plentiful as far west as Godolphin, and is by no means rare in suitable localities in the Land's End peninsula.

The Small Pearl-bordered Fritillary (*Argynnis selene*) is a somewhat local species, but widely distributed and in places common. Its headquarters in the county seem to be St. Martin's Wood, Looe, where some years it is abundant. It is usually fairly plentiful on Millook Common and about Poundstock, and occurs in favoured spots along the southern half of the county, but is rare west of Helford and in the district of the Lizard.

The Pearl-bordered Fritillary (*A. euphrosyne*) is also somewhat local, and its county distribution seems to be practically identical with that of the previous species. About Truro it is in most years decidedly commoner, but has not been recorded from the Lizard district at all.

The Dark Green Fritillary (*A. aglaia*) is common in most years along the north coast from Hennacliff to Tintagel, at Newquay, Perranporth, and St. Agnes. It often occurs plentifully here and there on the moors. In 1900 it was common near Cardinham, in 1902 at Trebartha, and some years ago was taken in considerable numbers near Liskeard. In the southern half of the county it is much more local than the two preceding species, and does not seem to have been taken in the Truro district at all. Spiller says it is very rare north of Helston, but common at the Lizard. The High Brown Fritillary (*A. adippe*) is apparently very local. It occurs not unfrequently in the valley at Millook, and from there sparingly to Wainhouse Corner (Goss). It is also recorded from the large woods in the east of the county, and appears to be common some years about Doublebois and Bodmin. From Truro westwards it is a rare casual. The Silver-washed Fritillary (*A. paphia*) is in some years fairly common in the Millook district and in the woods by the Tamar. It is frequently recorded along the southern half of the county. In the west its headquarters are at Trevarno Wood, Sithney. It is also common in a little wood at Cury Cross to the south of Helston.

The Greasy Fritillary (*Melitaea aurinia*) is very local, and does not seem to be common anywhere in the county. It occurs sparingly in places on the Lynher, and is not infrequent on a hill near the Cheesewring, where, according to Bignell, the specimens are much brighter in colour than those from the south of Devonshire. It has been taken near Looe, once by Tellam in the north of Bodmin, twice near Wadebridge, and once by Rollason near St. Austell. The Pearl-bordered Likeness or Heath Fritillary (*M. athalia*) is at times abundant at St. Martin's Wood, near Looe, but seems to be scarce elsewhere. On 1 July, 1902, five or six were seen on *Veronica chamaedrys* in a clearing in the American garden at Trebartha. It has been found occasionally in the southern half of the county as far west as Par, but is probably commoner than it seems to be, as it varies its haunt from year to year. It has been once reported from the neighbourhood of Falmouth.

The Large Tortoise-shell (*Vanessa polychloros*) is evidently nowhere common in the county, but is taken occasionally all along the south from Mount Edgumbe to Paul and St. Burian, near the Land's End. In the Poundstock district two or three specimens are taken almost every year, and it has also occurred at Mawgan and at Newquay.

The Small Tortoise-shell (*V. urticae*) is abundant all over the county and at Scilly from early spring till late autumn. Specimens have been not infrequently seen in December and January. Spiller has reared a thousand Cornish-laid specimens yearly at Godolphin for three years, and from

INSECTS

among them has obtained all forms recorded in Newman, including the form approaching *ichnusa*, the banded form approaching the Japanese *connexa*, and the remarkable abnormal form No. 3.

The Peacock (*V. io*) is common throughout the county and in some years is locally very abundant. It varies much in size. At one particular spot in the Liskeard district a very small form has been taken four seasons out of the last five which Staudinger accepted as the variety *ioides*. Spiller has taken an aberration at Godolphin with the right fore-wing fawn-coloured.

The Camberwell Beauty (*V. antiopa*) has been twice taken in the county. In the beginning of June, 1832, F. Holmes, Oxford, captured a weather-beaten specimen at Tregothnan, details of which will be found in the first volume of *The Ibis*. On 2 January, 1901, T. J. Porter of Hayle, when out shooting on Higher Spargo in Mabe, caught a fine specimen with his cap in the field called Sunny Corner. Charles Fox of Trebah, in the adjoining parish of Constantine, saw a Camberwell Beauty in his grounds many years ago, and another appears to have been seen in the valley of the Fowey above Lostwithiel.

The Red Admiral (*V. atalanta*) is common and generally distributed save on the moorland. In some autumns it is locally most abundant. In the first week of October, 1902, there must have been over four hundred at one time in a neglected orchard near Callington. This glorious sight lasted for several days. One calm sunny afternoon that same autumn there were two or three hundred at the ivy blossom on Launceston Castle.

The fitful and erratic Painted Lady (*A. cardui*) was plentiful over the greater part of the county up till a few years ago, but lately has become scarce, at least in the south and west of the county. In a good year it is still common about Poundstock and Millook, and one rarely sees a clump of Hemp Agrimony without one of these beautiful insects in attendance. In July, 1903, it was very common on St. Mary's, Scilly. In 1894 Spiller found several hundreds at Tremearne Cliffs that had just arrived from the south-east, with a few stragglers still coming in from the sea. They had a washed-out appearance and were much exhausted, as they allowed themselves to be picked up off the grass without resistance. They seemed to rest as well on the water as on land.

Of the three authenticated specimens of the American *V. huntera* captured in England, one in beautiful condition was taken by Miss C. L. Pole-Carew on 20 September, 1876, at Antony, near Tor Point, and recorded by Bignell in *The Entomologist*, ix, 255. There is no doubt it was an accidental introduction.

The White Admiral (*Limenitis sybilla*) appears to have been common at Godolphin early last century; but R. James, writing from Penzance to W. P. Cocks of Falmouth in 1849, says he had not seen one for nearly twenty years.

The capture of two specimens of *Danaus archippus* in the south of England in 1876 drew the attention of most entomologists to the extraordinary world-wide immigration of this American species. On 21 September, 1885, R. J. Anderson saw two and captured one at Trevilly, near the Land's End (*Entomologist*, xviii, 290). On 17, 24, and 29 of the same month A. H. Jenkin took three and saw a fourth near the Lizard, and Miss Rogers captured one at Penzance a few days later in the same year. In August, 1886, one was taken at the Lizard. Since that date no further occurrences have been recorded for the county, and the last appearance of the insect in England was in October, 1890. There seems to be no doubt that the specimens taken were all genuine emigrants and not cases of 'assisted passage.'

The occurrence of the Purple Emperor (*Apatura iris*) in the county rests on its reputed capture by a railway official near Bodmin some years ago, but the writer has not been able to trace either captor or specimen.

The Marbled White (*Melanargia galatea*) is confined to very restricted areas within which it is in some seasons common. It has been established in Werrington Park, Launceston, for at least fifty years, and in 1901 was unusually plentiful there. Bignell found it at Penhale, Egloskerry, in 1882, and it was taken there in 1899. At one particular spot on the Trebartha estate it is in most years quite common. In and about 1875 there was a flourishing colony at Trerice, Newlyn East, but it entirely disappeared many years ago, though two examples were captured in the valley of the Gannel in 1902. This appears to have been its most westerly settlement in the county. Stray specimens have at long intervals been recorded from the south of the county from St. Germans to Par, and in 1905 a sadly battered female was taken near Falmouth.

The Speckled Wood (*Pararge aegeria*) is common and in many places abundant throughout the county except on the moors. It is plentiful in almost every shady lane and round the shaded margins of most of the woods in the east and middle, and more generally diffused in the west. It does not seem to have been previously recorded from Scilly, but was taken on a wall near Great Grimsby, Tresco, in April, 1903. There are three and occasionally four emergences in the year, the first brood frequently appearing about Godolphin and Penzance before the end of March.

The sun-loving Wall (*P. megaera*) is common all over the county, and is the roadside butterfly *par excellence*. The sunny side of the Cornish hedgebanks suits it admirably, and it is often plentiful on warm dry grass, on sheltered sunny hillsides, and around protected coves on

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the south coast. At present it does not appear to be so abundant as it was fifteen years ago. Spiller says that about Godolphin it is triple-brooded in most years, the emergences occurring in early May, in July, and in October.

The Grayling (*Satyrus semele*) is abundant on the high heath land, the commons, and the sunny parts of the cliff from Morwinstow to Dizzard Head, and common on most of the heath and dry waste land of the county generally. On sheltered broken cliff land on the south coast it is often present in great numbers, but sits so close baking itself in the sun that it might easily be overlooked.

The Large Meadow Brown (*Epinephile janira*) is abundant both on the mainland and at Scilly. Very small specimens are occasionally taken about Ludgvan and Gulval in the third and fourth week in August in perfectly fresh condition, which Barrett thought probably belonged to a partial second brood. Many of the Scillonian specimens are richer in colour and more velvety in texture than the type. Bleached forms and varieties with extra ocelli on the upper wings are taken by Spiller every year at Godolphin. The Small Meadow Brown (*E. tithonus*) shows a marked affection for a Cornish hedgebank covered with a tangle of bramble canes. It is common and widely distributed over the county, but is neither so general nor so abundant as the preceding species. Bleached examples and varieties with bi- and tri-pupilled ocelli occur at Godolphin, and in 1903 Spiller took a melanic form there with two extra ocelli. The Wood Ringlet (*E. hyperanthus*) is local, but fairly common. About Poundstock and Millook it is usually common on the shady side of the taller hedgebanks and among the woods; and for several years has been plentiful in one particular haunt in the valley of the Gannel. In 1902 it was abundant near the bottom of the Cascade Wood, Trebartha, and round the upper pond. It occurs on the banks of the Tamar and the Lynher, and in colonies along the southern half of the county as far west as Falmouth. Casual specimens have been taken in the Land's End district.

The Small Heath (*Coenonympha pamphilus*) is common and generally distributed throughout the east and north-east of the county, fairly common in the middle, and local in the west.

The Brown Hairstreak (*Thecla betulae*) has been taken twice and seen occasionally by the Rev. G. Lupton Allen at Millook, and A. K. Peter describes it as fairly common some years about Poundstock. At least three single specimens have been captured around Bude and one at Kilkhampton. Two were obtained at Trebartha in 1902, and it has been taken in the valley of the Lynher.

The Green Hairstreak (*T. rubi*) is fairly common but local in the east, somewhat scarce as a rule in the middle, and rare in the west of the county. In good years it is of frequent occurrence about Millook and Launceston, in 1902 it was common at Trebartha, and is often taken at Saltash and Whitsand Bay East. It was fairly common in 1901 near Liskeard and Looe, plentiful in 1903 about Boscastle, and was taken at Lostwithiel and at Bodmin. Rollason reports it from Polperro and Truro, and Miss Snell has sent in specimens from St. Agnes. Spiller has taken two specimens at Godolphin, Marquand one near Penzance, and Mrs. Clark one at Hayle.

The Purple Hairstreak (*T. quercus*) is common and locally abundant in the east of the county and about Millook, is not infrequently taken about Liskeard and Bodmin, but is scarce further west. It has been recorded by Rollason from St. Austell and Burngallow, and by Spiller round the oaks at Godolphin, but has not been found in the Penzance district.

The Small Copper (*Polyommatus phloas*) is common and generally distributed throughout the county. It is in some seasons remarkably abundant in places along the south coast. Silvery white, pale golden, and black varieties have been found at various times, and Spiller chronicles one from Godolphin with the left fore-wing quite white.

The Silver-studded Blue (*Lycaena aegon*) seems to be practically restricted to the western half of the county. It is locally not uncommon on the moorlands of the Land's End country, is common on all the heaths and downs of the Lizard peninsula and of the Breage and Sithney parishes, is not infrequently obtained most seasons about Falmouth and Truro, and occurs regularly at Perranporth. Only occasional specimens have been recorded east of Burngallow, chiefly from Looe and Whitsand Bay. The females vary much in colour, some being almost indistinguishable from *L. minima*, while others show a great deal of blue.

The Brown Argus (*L. astrarche*) is local and apparently nowhere common in the county. It has been taken at Perranporth, Mithian, and for the last three years at Carbis Bay. In the south it appears to be commonest at Praa Green, but has been taken occasionally at Godolphin and once or twice about Penzance. Reading found it in the extreme east of the county nearly fifty years ago, but there is no recent record.

The Common Blue (*L. icarus*) is generally distributed, and in most districts abundant, especially near the sea. Colour variations are numerous. Though there is no chalk in the county the Chalk Hill Blue (*L. corydon*) has been obtained several times. Stephen Clogg found it tolerably abundant on the railway banks near Terras, Pill, and other places.¹ Bailly reported the occurrence of a single specimen at Paul, near Penzance; and Marryat took two near Whitsand Bay East.

¹ Newman, *British Butterflies*, 132.

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The Azure Blue (*L. argiolus*) occurs from Kilkhampton and Whitsand Bay to Penzance. It is somewhat local, but common, and in many places often abundant. The spring brood is always the most plentiful, and in bad seasons the autumn brood may not appear at all. In the wet August of 1903, for instance, not a single specimen could be found in a favoured haunt near Newquay, where hundreds had been seen the previous year.

The discovery of the Large Blue (*L. arion*) in abundance near Bude at the close of the eighties by Messrs. Waterhouse was a subject of keen interest to entomologists, as it had become extinct in its famous Northamptonshire haunts nearly twenty years before, was supposed to have died out on the Cotswolds, and had apparently disappeared from the hills of the South Devon coast, near Bolt Head and Kingsbridge. In some notes kindly sent by him to the writer of this article, Goss says :—

I first met with it in Cornwall, near Millook, a few miles south-west of Bude, in the first week of July, 1902. It was abundant in several localities between Bude and Boscastle from the middle to the end of June, 1893, and I again met with it in various localities on the north coast in June, 1896, and again in July, 1902. In the latter year it had established itself in two or three new localities, though its numbers near Millook had been reduced by the enclosure and cultivation of many acres of common land and the consequent destruction of its food plant [wild thyme].

In spite of wholesale destruction at the hands of so-called entomologists the species is still common in several localities, and is establishing new colonies about Tintagel and beyond.

The Small Blue (*L. minima*) has been thrice recorded for the county, but in the first two cases the voucher specimens proved to be colour variations of the female of *L. aegon*. Last year two examples in perfect condition were obtained near Saltash.

The Duke of Burgundy (*Nemeobius lucina*) was discovered in 1900 in a sunny glade in one of the larger eastern woods, and has occurred there sparingly every year since. This appears to be its only haunt in the county.

The Grizzled Skipper (*Syrichthus malvae*) is fairly common throughout the county, but somewhat local. The Dingy Skipper (*Nisoniades tages*) is not uncommon about Millook, Trebartha, and Bodmin. Rollason has taken it at Burngullow, and it is not infrequently captured about Truro, Falmouth, and Penzance.

The Small Skipper (*Hesperia thaumas*) is common throughout the greater part of the county, but does not seem to have been recorded for the Truro district.

The Large Skipper (*H. cybanus*) is common in congenial localities in the east and middle of the county and of frequent occurrence in the west.

A single specimen of the Silver-spotted Skipper (*Hesperia comma*), a female in faultless condition, was taken by Marryat at Whitsand Bay East in July, 1890.

HETEROCERA

CARADRININA

ARCTIADAE

Oenistis quadra is widely distributed, but local, and apparently nowhere common except occasionally at Scilly. *Lithosia complana* is usually scarce and local along the southern half of the county, but was reported by Marshall as abundant about Botus-Fleming, and one specimen has been taken at Padstow. *L. lurideola* is generally distributed, but not very common. *L. griseola* is rare and has been taken only at Mount Edgcumbe, the valley of the Lynher, Bodmin, and Looe. *L. caniola* is represented by two specimens from near the Dodman. *Gnophria rubicollis* occurs at Dunmeer, Bodmin, and sparingly at Altarnun and in the east. *Cybosia mesomella* has been obtained above Liskeard, and by Tellam from Colquit and Dunmeer Woods, Bodmin. *Setina irrorella* was taken over forty years ago by J. S. Dell at Whitsand Cliffs and Mount Edgcumbe, but has not been recorded since. *Mitochrista miniata* is very widely distributed along the coast, but apparently nowhere common. A solitary example of *M. senex* was taken at Marazion on 11 July, 1900. *Nudaria mundana* is everywhere scarce except about Penzance. *Roeselia confusalis* has been obtained by A. Rashleigh in the middle of the county, and was taken last year at Saltash and at Looe. *Nola cucullatella* is occasionally found about Truro, Falmouth, and Penzance. The beautiful but variable *Sarothripus undulana* is taken occasionally in the valley of the Lynher. *Hylophila bicolorana* has been recorded from Launceston, and *Halias prasinana* from Liskeard, Penzance, Bude, and Newquay. *Tyria jacobaeae* is common almost everywhere. The lovely *Utetheisa pulchella* is in some years not uncommon at intervals along the south coast, but has been very scarce even in its favourite haunts since 1902. *Phragmatobia fuliginosa* is generally distributed in the south and at Scilly, and local in the north, but is not plentiful anywhere.

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Diacrisia mendica is found sparingly in the east and middle of the county, but is only occasionally taken west of Truro. *D. mentastri* and *D. lubricipeda* are everywhere abundant. At Tresco the larvae of the latter feed regularly on mesembryanthemum. *D. russula* is scarce and local in the southern half of the county, but common in some of the moorland districts. *Arctia plantaginis* has been taken by Marquand about Penzance, and lately above Trebartha. *A. caja* and *A. villica* are very general in their distribution. The latter is in places somewhat scarce, and has not been recorded from Scilly. *Callimorpha hera* is reported to have been once taken near Saltash. *C. dominula* is occasionally obtained in the east and about Launceston. Two specimens were captured in 1904 near St. Cleer.

CARADRINIDAE

Cucullia absinthii is rare, but has been taken at Looe, and at long intervals in the middle and west of the county. Reading says the larvae of *C. chamomillae* are found abundantly on *Matricaria inodora* and *maritima* on the semi-marine shores and wastes bordering Plymouth Sound and the estuaries of the Tamar and Lynher. It has been obtained in the west by A. H. Jenkin. *C. umbratica* occurs all along the south and in some years is locally remarkably abundant. *C. scrophulariae* is not uncommon locally in the larval state, but is not often taken on the wing. The larvae of *C. verbasci* are at times abundant locally. The insect occurs all over the county and at Scilly. *Polia exoleta* and *P. vetusta* are for the most part confined to the east of the county. *P. solidaginis* has been taken near Liskeard, and a single example of *P. semibrunnea* has been sent in from Launceston. *P. socia* and *P. ornithopus* are very local, occurring, however, both in the east and in the west of the county. *P. lambda* has been recorded from Falmouth, but probably in error. *P. areola* is plentiful in most localities in March and April. *P. viminalis* is occasionally taken near the Tamar. *P. lichenea* is irregularly distributed along the south, and apparently rare in the north. It has been taken at Scilly. *P. protea* and *P. aprilina* are thinly spread through the county, especially in oak coppices. *P. chi* and *P. flavicincta* occur not infrequently in the east and about Liskeard, and are on rare occasions taken further west. The first example of *P. xanthomista* taken in the British Isles was captured by Mrs. Fisher near Padstow. It has also been obtained by H. W. Vivian at Bosahan. *Dasyptolia templi* was recorded by Reading as not uncommon near Plymouth, and was taken by Bailly near Penzance. *Miselia oxyacanthae* is by no means uncommon in damp wooded localities throughout the county, and at times is very plentiful. *Diloba coeruleocephala* has been twice obtained near Launceston, and has been reported from St. Germans. The sluggish *Asteroscopus sphinx* occurs sparingly as far west as Lostwithiel, but its habits and colouring cause it to be overlooked. *Aporophyla australis* is very local and probably rare, but was recorded from the west by A. H. Jenkin, and has been taken lately at Mount Edgcumbe. *A. lutulenta* and *A. nigra* have been taken by the estuaries of the Tamar and Lynher, and the latter is not uncommon at Godolphin. *A. lunosa* is generally distributed, but is not common. *Heliophobus hispidus* has been occasionally captured in the Saltash district.

Two specimens of *Orthosia xerampelina* were taken in 1902 near Launceston, and one was captured by Spiller at Godolphin in 1898. *O. croceago* was bred by Marshall at Botus-Fleming, and has been taken several times lately in the east and south-east of the county. *O. citrigo* and *O. aurago* are both rare. The former has been obtained near Looe and the latter at Caerhayes. *O. flavago* was taken by Vivian at Bosahan, and three were found near Newquay in 1899. One specimen of *O. fulvago* was captured near Liskeard, and one was taken by Adkin at Scilly. *O. circellaris* is generally distributed along the south, but is not common. *O. helvola* and *O. litura* are of frequent occurrence in the east. *O. pistacina*, *O. macilenta*, and *O. lota* come freely to sugar in most parts of the county in September. *O. ypsilon* seems to be limited to the south-eastern district, where it is scarce. *O. satellitia* in the late autumn is one of the most abundant moths at sugar about Callington and Liskeard, but is seldom taken in the middle and west. *Conistra ligula* and *C. vaccinii* are widespread and often plentiful at sallows in spring, and on ivy in November. *Leucania turca* has only been recorded from Werrington Park, Launceston, and by Marquand from about Penzance, but *L. lithargyrea* is everywhere abundant. In September, 1901, two examples of the rare *L. albipuncta* were captured by Tregelles at Falmouth. *L. littoralis* is irregularly distributed among the sandhills round the coast and at Scilly, and is very common about Bude. *L. conigera* is widespread and plentiful, but somewhat local. The rare *L. vitellina* and the still rarer *L. unipuncta* were taken at Scilly by Adkin in 1893. *L. comma* has been captured in the Lynher Valley, and is uncommon about Penzance. A single female of *L. putrescens* was captured near Looe on 22 July, 1902, and a male of *L. impudens* at Marazion in 1904. *L. straminea* is occasionally taken at Bodmin and has been recorded by Marquand from Penzance. *L. impura* is general and *L. pallens* abundant all over the county. *Monima incerta* is locally very plentiful. *M. gracilis* and *M. stabilis* are widely diffused on sallows in the spring. The former is apparently nowhere common, the latter is often abundant. A solitary specimen of *M. populeti*

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was taken on the window of the lecture room at Liskeard in March, 1901. *M. miniosa* appears to be very local, but on rare occasions extraordinarily abundant about the lower reaches of the Lynher. *M. pulverulenta* and *M. munda* are often common in the east by the second or third week in March, but are evidently scarce in the middle and west. *M. gothica* is widespread and on the whole common. *Charaetas graminis* in the larval stage was abundant near Altarnun in May and June, 1899. On the wing it has been taken on Whitsand cliffs and near St. Burian. *Neuronia popularis* is widespread and common. *Panolis piniperda* is sparingly distributed along the southern half of the county and is fairly common at Godolphin. *Harmodia nana* is local and scarce along the south, but at times common at Scilly. Four specimens of *H. luteago* var. *Barrettii* were taken by Ficklin near Land's End in 1897 and four more in 1898. *H. carpophaga* was found by Reading at Whitsand Bay East, and has been taken at intervals along the coast as far as the Lizard. *H. cucubalis* is thinly diffused along the south, and evidently local; stray specimens are occasionally found inland. *Melanchra cespitis* and *M. reticulata* are rare and local. Both have been taken about Mount Edgcumbe and by the Lynher. The former is recorded from Scilly and the latter from Bodmin and Falmouth. *M. serena* is local and in places common along the south. *M. trifolii* is widely spread but scarce on the mainland, and fairly common at Scilly. *M. dentina* has been recorded chiefly from the west, but has been taken at Heligan, near Mevagissey, and sparingly in the east. *M. thalassina* is scarce but evidently widely distributed. *M. dissimilis* has only been recorded from the Penzance district by Marquand. *M. oleracea* and *M. pisi* are common almost everywhere on the mainland and at Scilly. *M. advena* was taken by Reading at Antony along with *M. nebulosa*. The latter has lately been found at Looe. The larvae of *M. brassicae* are at times among the most destructive pests in both flower and vegetable garden, as nothing seems to come amiss to them in the way of food. On cabbages their attack is ruinous, as they gnaw large holes down into the heart and leave behind a disgusting excrement. In 1901 they were unusually abundant about Truro, and did great damage to vegetables, herbaceous borders, and even to bedding plants. *M. persicariae* is widely distributed but by no means common. At Newquay, however, it was plentiful in July, 1902. *M. albicollis* has been taken at Bodmin and near Penzance. *M. myrtilis* is widely spread but local and scarce; it has been taken on St. Cleer Down, at Bodmin, at Falmouth, and occasionally further west. *Agrotis vestigialis* is not uncommon on the coast both in North-east and South-east Cornwall, but is evidently rare elsewhere. *A. corticea* is occasionally taken from Bodmin westward, but has not been recorded from the east. The larvae of *A. segetum* and *A. exclamationis* are occasionally very destructive to turnips, green corn, cabbages, and garden seedlings. The last serious attack in the county was in the Liskeard district in 1898, but since that time both species have been somewhat scarce, and for the last six years not a single specimen of *A. exclamationis* has been recorded in the Truro district. In 1902 this species destroyed some rows of garden turnips and of cabbages at Newquay. In the early eighties these cutworms did an enormous amount of damage in the west of the county. *A. ypsilon* is variable in its appearance, but in 1902 came freely to sugar in most districts. *A. lunigera* is rare and local along the south coast, but plentiful at Scilly. *A. obelisca* has been recorded only from Mount Edgcumbe, Padstow, and Scilly. *A. nigricans* occurs sparingly in East Cornwall, and one specimen has been taken at Paul near Penzance. *A. saucia*, the beautiful Pearly Underwing, is usually very scarce throughout the county and at Scilly, but in 1892 it was plentiful along the south and especially in the west. *A. ripae* occurs in fair numbers at Bude, also about Dizzard Head (Goss) and on the sandhills between Newquay and Hayle. *A. puta* is frequently taken at sugar in different parts of the county and is fairly common at Scilly. *A. plecta* is abundant in most districts. *A. strigula* was taken at Sandcreed in 1892, and has twice been recorded subsequently from the east of the county. *A. tritici* is widely distributed but nowhere very common except occasionally at Scilly. Four specimens of the scarce *A. augur* were taken at Looe in July, 1900. *A. lucerneae* has been recorded by Reading from Whitsand cliffs and by Marquand from Penzance. *A. putris* and *A. c-nigrum* are widespread and common and occur at Scilly. *A. ditrapezium* was obtained near Falmouth in July, 1904. *A. triangulum* has been occasionally taken in the south-east and once at Scilly. *A. pronuba* fluctuates considerably in numbers but is often abundant. Its larvae do great injury at times to clovers and grass generally, but there has been no serious attack since the early nineties. *A. comes* as a rule is common on meadow grass in every district. *A. brunnea* is scarce and local except in the south-east, where it is at times fairly common. *A. xanthographa* is common everywhere and often abundant. *A. castanea* has been recorded from St. Cleer Downs and from Whitsand Heights, and was taken some years ago in the west. *A. rubi* and *A. festiva* are not uncommon along the south of the county, and are occasionally taken at Scilly and in the north. A solitary specimen of *A. dahlia* was taken by Baily in Trevaylor valley in 1883. *A. glareosa* is generally rare throughout the county, but in 1893 was very common in West Cornwall. *A. depuncta* was taken in the Looe valley in July, 1902, and was reported last year from Callington. *A. typica* occurs in damp localities throughout the county and comes freely to sugar.

A HISTORY OF CORNWALL

Triphaena fimbria is scarce except in the extreme east of the county. *T. ianthina* is generally distributed and fairly common. *T. interjecta* is scarcer and more local than the previous species, but commoner at Scilly. *T. baja* comes frequently to sugar in most of the Cornish woods. *T. rubricosa* is common at Godolphin, but evidently rare and local elsewhere. *T. prasina* has been occasionally taken at sugar about Antony and Liskeard. *Heliothis armigera* is rare, but has been taken several times along the south coast, and was obtained by Allen at Millook in 1905. *H. peltigera* is usually scarce and local, but in some seasons, like 1893 and 1898, fairly plentiful at places in the south. *H. dipsacea* was taken by Mr. White near Trefusis Wood in July, 1840. There is no further record till 1902, when a specimen was taken at Manaccan. The larvae of *Ochria ochracea* are often abundant in foxglove stems. In the mature state it is generally distributed. *Nonagria arundinis* was obtained by Reading at St. Germans more than forty years ago. This was the only county record till last year, when two specimens were taken at Marazion. The variable *Luperina testacea* is common throughout the county and at Scilly. A single specimen of the rare *Spodoptera exigua* was taken by Baily at Paul. *Rusina tenebrosa* is sparingly distributed along the south from the Tamar to the Lizard. *Amphipyra pyramidea* is local but not uncommon at sugar in some districts. *A. tragopogonis* is more generally distributed than the last, and has been taken from Cotehele to Scilly. *Caradrina pyralina* has been captured on more than one occasion near Lostwithiel. *C. diffinis* is very rare, and has been taken only at Heligan near Mevagissey. *C. affinis* has occurred at Antony, Maker, Looe, and Mevagissey. *C. trapezina* is frequently found in the east of the county, but is rare elsewhere. *C. umbra* has been obtained only at Whitsand cliffs, at Cremyll, and at Falmouth. *C. micacea* is rare but very widespread; it is at times fairly common about Penzance. *C. fulva* has been taken near the Land's End on two separate occasions. *C. quadripunctata* is general throughout the county. *C. morpheus* is widely distributed but by no means common. *C. alsines* is represented by four or five specimens all taken singly and in distant localities. *C. taraxaci* is fairly common in the east, but somewhat scarce in the west. *C. trigrammica* has been taken sparingly from the Tamar to Bodmin. *C. matura* has been obtained several times near the Land's End and at Scilly. *Stilbia anomala* was captured by J. C. Dale at the Land's End. *Hadena meticulosa* is abundant, *H. lucipara* fairly common, and *H. maura* somewhat scarce all over the county. *H. scabriuscula* has been taken once near Launceston. *H. adusta* was found by Reading at Antony and St. Cleer, and by the Marquands at Penzance. *H. gemina* is widely distributed but scarce. *H. polyodon*, *H. lithoxylea*, and *H. rurea* are common almost all over the county, the first-named in places abundant. A single example of the rare *H. sublustris* was taken near Launceston in June, 1901. *H. scolopacina* has been twice obtained lately at Newquay. *H. hepatica* is common at sugar throughout the eastern districts, but is scarce elsewhere. *H. furva* was twice secured by Reading at Whitsand Bay East. *H. abjecta* was captured by Tellam at Endellion and was recorded by A. H. Jenkin. *H. sordida* and *H. basilinea* are scarce, but occur in most districts. Three specimens of *H. unanimitis* were found near Looe in June, 1905. *H. didyma* is everywhere common. *H. nictitans* occurs near Probus. *H. strigilis* and *H. bicoloria* are common, *H. literosa* and *H. fasciuncula* somewhat scarce throughout the county. *Metachrostis perla* is very local but not uncommon among lichens and moss on old hedgebanks. *M. muralis* is more widely spread, and about Plymouth and at Scilly often plentiful. *Moma orion* is rare, but was taken at West Looe in 1856 and at Helford in 1899. *Acronycta leporina* appears to be confined to the extreme south-east of the county, where it is in some seasons not uncommon. The scarce and beautiful *A. alni* has twice been taken in the larval state, namely, by A. H. Jenkin in 1886 and by Baily at Paul in 1893. *A. tridens* occurs sparingly in gardens about Liskeard and Penzance. *A. psi* is one of our commonest moths. *A. megacephala* is not uncommon in the south-east and has been recorded from Liskeard and Bodmin. *A. aceris* was obtained by J. S. Dell at Mount Edgumbe and Saltash. Five specimens were taken at Whitsand Bay East in June 1904. *A. ligustri* is rare and apparently limited to the east of the county, where examples have been occasionally captured during the last five years. *A. rumicis* with its striking larva is common in woods everywhere. *A. menyanthidis* and *Arsilonche albovenosa* were recorded by Marquand from West Cornwall and are both very unexpected casuals.

PLUSIADAE

Aethia tarsipennalis and *A. nemoralis* are widespread but local, and the latter is scarce. *Herminia barbalis* occurs about Liskeard and probably elsewhere, but has been confounded with *A. tarsipennalis*. *Hyphenodes costistrigalis* has been taken sparingly both by the Marquands and by Baily about Penzance. *H. albistrigalis* was reported by Jenner Fust and has been twice taken at sugar near Kilkhampton. *Bomolocha fontis* was recorded by Tellam from Bodmin. *Hyphenodes rostralis* was not uncommon in 1904 near St. Germans, and has also been captured at Bodmin. *H. proboscidalis* is abundant among coarse road-side herbage. A solitary specimen of *Aventia flexula* was obtained near Doublebois in July, 1902. *Ophiura pastinum* is also represented by a single male taken near Boscastle in July, 1903. The sluggish *Scoliopteryx libatrix* is not uncommon throughout the

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county in the early autumn. *Plusia chrysis* and *P. iota* are generally distributed and in some seasons frequent. *P. orichalcea* was recorded from Cornwall in the *Entomologist's Annual* for 1871; it has recently been taken at Mount Edgumbe. *P. festucae* has been recorded from Whitsand Bay, Falmouth, and Penzance. *P. pulchra* was taken by Reading at Saltash and by Baily at Paul. In 1904 it was found near Liskeard and at Altarnun. *P. gamma* is everywhere plentiful from May to September. An example of *P. ni* was taken by Miss Carne in her garden at Penzance in May, 1869 (*E. M. M.*, iii, 188). One of *P. interrogationis* was captured in the woods at Trevice near Newquay in July, 1902. *P. tripartita* and *P. triplasia* are generally distributed on the mainland and at Scilly; the former is in some districts common. A fine specimen of *Catocala nupta* was taken at sugar near Looe by Marryat in 1890. *Euclidia mi* and *E. glyphica* are locally distributed along the southern half of the county; the former is somewhat scarce, the latter in some seasons plentiful. *Erastria fasciana* is widespread but local, and nowhere common. *Eustrotia venustula* has been reported from Mousehole, but evidently in error. *E. luctuosa* has been taken on clover lately at Looe. *E. uncula* was not uncommon at Falmouth fifty years ago, but has apparently died out; Marquand recorded it from Penzance. *E. viridaria* is commoner on the heaths and moorlands of the east than of the west. *Panemeria tenebrata* is not infrequently taken in South-east Cornwall and occasionally as far west as Falmouth. *Rivula sericealis* is very local, but not uncommon along the south.

OCNERIADAE

Orgyia gonostigma has been taken singly from time to time in the southern half of the county, but is very scarce. The larvae of *O. antiqua* do occasional damage locally in Cornish gardens and orchards by devouring the foliage of the trees and shrubs. Apple trees have been attacked at Launceston and St. Columb, roses and laburnum at Bodmin, and a pear tree at Liskeard, but so far the mischief done has been small compared with its ravages in some counties. *Dasychira pudibunda* is common in woods and copses throughout the county, but has not been recorded from Scilly. The larvae are at times abundant on the young shoots of the elm. *Colocasia coryli* has been taken at Launceston, North Hill, Camelford, Liskeard, and Restormel. *Porthesia similis* has been taken in the Land's End district and occasionally at Scilly. *Euproctis chrysorrhoea* was obtained in the west by A. H. Jenkin. *Stilpnotia salicis* was obtained by Marryat near Looe in 1890, and has been taken lately near Calstock. *Ocneria monacha* has been frequently captured in East and Middle Cornwall but does not seem to have been recorded west of Truro. *O. dispar* was taken by Marshall at Botus Fleming.

NOTODONTINA

HYDRIOMENIDAE

Trichopteryx viretata has been reported from Bodmin and from near Helston, and was taken in 1902 at Launceston and Lostwithiel, and last year at Newquay and Millook. *T. carpinata* was first recorded by A. H. Jenkin, but has been subsequently obtained near Calstock, at Trebartha, and near St. Columb. *Mysticoptera sexalisata* was obtained in 1905 close to Liskeard. *Lobophora balterata* has been recorded from East Cornwall by Marshall, and was twice taken last year on the banks of the Lynher and once near North Hill. *Chloroclystis coronata* occurs very sparingly near Lostwithiel and has been obtained near Cargreen, at Liskeard, in the Penzance district, and by Adkin at Scilly. *C. rectangulata* is common in orchards throughout the county, and in some seasons, notably in 1900, the larvae do considerable mischief by feeding on the flower buds and newly formed fruit. In 1905 it practically destroyed the apple crop in one or two gardens around Bodmin, and specimens were sent in for identification and advice from Truro and from Penryn. *C. debiliata* is scarce and local, but has been obtained at Altarnun, Liskeard, Truro, and Newquay. *Gymnoscelis pumilata* is widely distributed, and in places not uncommon, especially in West Cornwall and at Scilly. *Tephroclystis venosata* is scarce, but has been found at Mount Edgumbe, Callington, Bodmin, and Falmouth, and has been bred from the pods of *Silene maritima* from Padstow. *T. expallidiata* was captured by Miss L. M. Saunders at the flowers of golden-rod near Bishop's Wood, Truro. *T. campanulata* was taken several times by Marshall in East Cornwall. *T. minutata* was captured in 1901 on heather near St. Cleer, and in 1902 at Cardinham. *T. absinthiata* is widespread but local; it has been taken lately on the middle Lynher, at Looe and at Fowey, is not uncommon some seasons at Scilly, and was recorded by Cocks from Falmouth and by Marquand from Penzance. *T. assimilata* occurs at times among currant bushes at Liskeard and Bodmin, and has been taken once at Newquay. *T. valerianata* was bred from larvae on the fruits of valerian at Bodmin in 1902, and two were captured at Millook in 1904. *T. albipunctata* has been taken at Angelica near St. Germans and at Looe. *T. vulgata* is mentioned by Atmore as common about Penzance. *T. oblongata* is local, but not uncommon, especially at Padstow, Helston, and Scilly,

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and has been taken at Newquay, Liskeard and Mitchell. *T. subfulvata* was recorded from East Cornwall by Marshall, and has been taken at Looe, Liskeard, and near Trebartha. *T. satyrata* was reported from East Cornwall by Marshall and doubtfully from Scilly by Adkin. *T. pulchellata* is widely distributed, usually on foxglove, but nowhere common. It has been captured at Mount Edgcumbe, Looe, Liskeard, Truro, Penzance, Scilly, Newquay, and Launceston. *T. linariata* is generally distributed in the eastern half of the county, but rather scarce. *T. succenturiata* is rare about Penzance and Godolphin. *T. castigata* occurs not uncommonly in the Land's End district. *T. lariciata* is occasionally taken in the valley of the Lynher, at North Hall (Launceston) and at Bude. *T. virgaureata* was recorded by A. H. Jenkin and has been obtained recently near Saltash. *T. plumbeolata* is represented by three county specimens, one taken by E. P. Marquand, one found near Stratton, and one at Looe. A single example of *T. isogrammaria* was captured close to Launceston in 1902, and one of *T. trisignaria* at St. Germans in 1905. *T. indigata* was reported from the county by Jenner Fust and has been taken at Calstock. *T. constrictata* was obtained by Whitworth near Dizzard Head in 1900, and had previously been recorded by Jenner Fust. *T. subciliata* was bred from a larva found on the flowers of maple near Looe in 1899. *T. pusillata* has been taken twice near Liskeard. *T. abbreviata* is thinly distributed in oak coppices in the east and north-east of the county. *T. dodoneata* was recorded by Marshall from East Cornwall, and was found in 1902 near Menheniot. *T. exigua* is widely spread but local; it has been obtained at Maker, Trebartha, Altarnun, Bodmin, Newquay, Falmouth and Penzance. *T. irriguata* has been taken once in the valley of the Lynher. *T. insigniata* was found near Bodmin by Tellam. *T. innotata* is rare, but has twice been captured near Gyllyngvase, Falmouth. *T. nanata* is not uncommon on heathland throughout the county, and has been found in the larval stage at Scilly. *Eucymatoge subnotata* was taken near Newquay at *Chenopodium* in July, 1902. It has been captured several times at Scilly. *E. scabiosata* was obtained about twelve years ago near Launceston, and in 1904 three were taken close to the same spot. *E. togata* was captured in the Land's End district in 1901. *E. tersata* was found at Falmouth two years ago. *Eucestia spartiata* has been captured near St. Columb, and a single example was obtained at Paul in 1893. *E. plagiata* is widely spread, but not very common, and for two or three seasons in succession almost disappears. It has been taken recently at Saltash, Falmouth, Land's End district, and Newquay. *Calocalpe certata* was obtained in 1903 near Kilkhampton. *C. undulata* is very sparingly distributed over the east of the county, and in the valleys that descend from the Bodmin Moors on the eastern and southern sides. It has also been taken by Tellam at Bodmin. *Philereme vetulata* has been taken by Tellam at Bodmin. *Eustroma prunata* is common in gardens and hedgebanks throughout the county. *E. associata* was reported by Marshall from East Cornwall and by Cocks from Falmouth. *E. populata* was first recorded from the county by Jenner Fust, but has since been taken on whortleberry at Launceston and Liskeard. *E. testata* has been captured at Saltash, Doublebois, Mevagissey, and Bodmin, and has been reported from Penzance by Baily. *Plemyria bicolorata* has been recorded from Doublebois, Penzance, and by several entomologists from Scilly. *P. tristata*, for the most part a northern highland species, was captured in June, 1900, near Altarnun. *P. rivata* is fairly common but local. *P. sociata* is widespread, and in most seasons taken pretty frequently; at Scilly it is not uncommon. *P. galiata* has been recorded from East Cornwall, Bodmin, Penzance, and Scilly, and was captured last year at Newquay and at Heligan near Mevagissey. Three specimens of *Cataclysmus virgata* were taken near Holywell Bay between Perranporth and Newquay in May, 1904.

Hydriomena ocellata is widely spread, but evidently nowhere common; it has been taken at Launceston, on the Lower Lynher, at Bodmin, Falmouth, Penzance, and Tresco. *H. variata* was recorded by Tellam from Bodmin and by A. H. Jenkin from Redruth. *H. fulvata* occurs sparingly along the south and at Newquay. *H. dotata* is generally distributed and often abundant in lanes and gardens. *H. picata* is occasionally taken by the side of copses and along tall overgrown hedges near Launceston, Liskeard, and Bodmin. *H. miata* is widely distributed at ivy and willow, but usually rather scarce. *H. siterata* is not uncommon in the east of the county during the autumn, but is rare in the west. *H. sordidata* occurs frequently throughout the county and has been recorded from Scilly. *H. trifasciata* has been recorded from East Cornwall, Bodmin, and Penzance, but is scarce and local. *H. truncata* is fairly common and widely distributed; it has been several times obtained at Scilly. *H. silacea* is often plentiful in the open woods in the east of the county on willow herb and enchanter's nightshade. It is very local in the middle and west, but has been taken at Bodmin, Newquay, Penzance, and Burian Bottoms. *H. corylata* is widely spread and often common in the eastern woods, but becomes gradually scarcer towards the west. *H. suffumata* is generally distributed and plentiful. *H. caesiata* was taken on whortleberry near Altarnun in June 1900. *H. dubitata* has been obtained at Kilkhampton, at Botus-Fleming, Bodmin, and Falmouth. *H. badiata* is widely distributed and of frequent occurrence. *H. nigrofasciaria* is occasionally obtained about the woods near Launceston, Liskeard, Doublebois, Bodmin, and Truro. *H. rubidata* has been taken at Looe, Mevagissey, Bodmin, and by Jenkin in the west. *H. cuculata* was first

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recorded from Cornwall by Jenner Fust, but has since been taken singly at Altarnun, Lostwithiel and Swanpool, Falmouth. *H. albicillata* was found in East Cornwall by Marshall, and has been obtained lately near Wadebridge. *H. unangulata* is not uncommon in woods and old hedgebanks throughout the county. *H. taeniata* has evidently been recorded in error; there is no specimen in any available county collection. *H. unifasciata* has been captured between Launceston and Altarnun, and near Kilkhampton. *H. alchemillata* is widely distributed along the south coast and has been bred at Newquay from larvae on *Galeopsis tetrabit*. *H. affinitata* is widespread and often abundant, but has not been recorded from Scilly. *H. decolorata* is widely distributed, but in very variable numbers throughout the county; it has been taken at Scilly by Adkin. *H. albulata* is sparingly distributed in the south-east, and has been taken on yellow rattle near St. Columb. *H. procellata* was recorded by Marshall from East Cornwall, and a solitary example was captured in July, 1904, at Drayne's Wood near Liskeard. *H. bilineata* is widespread and often abundant. It was very common at Tresco, Scilly, in July, 1903. *H. fluviata* was taken by Messrs. Marquand near Penzance. *H. polygrammata* was captured by Marshall in East Cornwall. *Pelurga comitata* was recorded by Tellam from Bodmin, and by A. H. Jenkin from West Cornwall.

Operophtera brumata, the winter moth, is perhaps the most injurious of all the British orchard pests. In Cornwall for the past seven years at least it has done comparatively little damage, but as it is generally distributed throughout the county it might suddenly become a grave menace to the fruit-growing industry should a season come round when it was specially favoured by heat and drought. In 1887 several orchards in the Penzance district suffered severely, and the blighted scorched appearance presented by some neglected apple trees in the Truro district in 1902 formed an impressive object lesson. Grease-banding the trees in the early autumn, so as to prevent the ascent of the wingless females, is the most effective of the various preventative measures in occasional use.

Euchoeca luteata appears to be confined to the eastern half of Cornwall. It was first recorded by Marshall, but has been found subsequently at Launceston, Calstock, and in the middle reaches of the Lynher valley. A single specimen was taken near Newquay in 1900. *E. oblitterata* is at times not uncommon on alder in the east, and has been taken as far west as Pendarvis, Camborne. *E. sylvata* is very local, but occurs in several of the woods near the Tamar, and has been taken at Altarnun and above Liskeard. *Asthena candidata* is also apparently confined to the east of the county, where it is taken sparingly in sylvan glades and 'twixt wood and field.' *A. dilutata* is occasionally captured in woods and old country lanes. It is widely distributed, but usually scarce.

Jenner Fust is the only entomologist who has obtained *Xanthorhoe vittata* in the county. *X. cervinata* has been taken sparingly along the south and at Newquay and Bude on the north coast. *X. limitata* appears to be common in gardens everywhere. *X. plumbaria* is fairly plentiful as a rule on rough cliff-land and on open downs. It has been captured at Scilly by Jenkinson. *X. bipunctaria* occurs sparingly about Saltash, and has been taken at Looe and Liskeard. *X. multistrigaria* is local and scarce. It was recorded by A. H. Jenkin from the west, and three specimens were taken near Liskeard in 1904. *X. didymata* is wide-spread and at times common. *X. ferrugata* is generally distributed and in most districts plentiful. *X. designata* is found in woods throughout the county, but has been noticeably scarce since 1902. *X. montanata* is widely spread and often plentiful. *X. fluctuata* is common almost everywhere. Two specimens of *X. salicata* have been taken at different times close to Bude; they are both in perfect condition. *X. olivata* is local and very irregular in its appearance, and though usually very scarce will without apparent reason become quite plentiful locally. In 1900 it was very common at Newquay, and in 1904 at Mevagissey. *X. viridaria* is usually abundant in open woods and rough scrubby land. A single example of the rare and local *Rhodometra sacraria* was taken at Looe in August, 1904.

STERRHIDAE

Eois rusticata is said to have been taken at Rame Head, but there is no recent record. *E. virgularia* is not uncommon in the east of the county and has been taken singly at Truro, Falmouth, Godolphin and Penzance. *E. dilutaria* is very erratic in its appearance. In 1886 it was reported by Atmore as common about Penzance, but only two specimens have been taken there since. In some years it is fairly plentiful in the east, but in 1900, and again in 1904 and 1905, not a single example was obtained. In 1902 it was occasionally captured at Newquay. *E. subsericata* is not uncommon about Looe and has been taken at Liskeard, Bodmin, and once at Penzance. *E. aversata* is common throughout the county and at Scilly. The banded form (var. *spoliata*, Stgr.) occurs occasionally. *E. emarginata* is local and seems to be for the most part confined to the eastern districts. *E. dimidiata* is not uncommon in places along the south, and has been taken at Launceston and Newquay. *E. trigeminata* has been recorded from Bodmin by Tellam, from Penzance by Bailly, and from Scilly by Adkin. *E. bisetata* is not uncommon in and about woods and deep lanes with overgrown banks. In 1903 it was plentiful at Tresco.

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Leptomeris remutaria has occurred at Calstock, Liskeard, and Bodmin, but does not appear to be at all common. *L. immutata* has been taken up the valley of the Lynher. *L. marginepunctata* is plentiful locally all round the coast, and has been captured at Altarnun. *L. ornata* was recorded by Marshall from East Cornwall. *L. imitaria* has been obtained in some numbers at Looe, Mevagissey, Bodmin, Newquay, Scilly, and occasionally elsewhere. *L. emutaria* was captured by Marshall in East Cornwall. *L. strigilaria* was reported by Tellam, but there is no specimen in any available Cornish collection.

Leucophthalmia pendularia has been taken twice near Liskeard. A single specimen of *L. porata* was captured in June, 1902, at Kilkhampton. It has also been recorded by Norgate from Tresco, Scilly. *L. punctaria* is also rare, but has been taken at Trebartha and near Liskeard. It was also recorded from the county by Jenner Fust. *L. trilinearia* occurs sparingly and locally between the Bodmin Moors and the Tamar. Four specimens of *L. annulata* were taken at Looe in 1890 by Marryat. *Calothyranis amata* in 1901 was not uncommon about Ellbridge and near Callington, but has not been seen since 1903.

GEOMETRIDAE

Nemoria strigata is common on old overgrown hedgebanks throughout the county, including Scilly. A single example of *Euchloris pustulata* was taken in July, 1900, near Calstock. *E. vernaria* is recorded by the Marquands and by Baily from the Penzance district. *E. lactearia* is widely scattered and in occasional seasons locally plentiful. The beautiful *Geometra papilionaria* is generally distributed, but does not appear to be common anywhere. *Pseudoterpna pruinata* is taken sparingly throughout the county.

MONOCTENIIDAE

Erannis aescularia can scarcely be regarded yet as a dangerous pest on Cornish fruit trees, but like the winter moth it is widely spread and under favourable conditions might become very troublesome. In 1901 eggs were found near Callington on two Czar plums and several neighbouring apple trees that were cankered. The following year eggs were found in some number on Czar plum trees at Launceston, and in 1902 the insect was evidently making headway in the Newquay and St. Columb district, as caterpillars were brought in from that neighbourhood by three different people. Since that year only two examples of the moth have been captured and no further eggs or larvae have been received.

SELIDOSEMIDAE

Opisthograptis notata is apparently very scarce, but has been taken at Looe, and by Tellam at Bodmin. *O. alternaria* was recorded by Jenner Fust and has been captured at Liskeard. *O. liturata* has also been taken near Liskeard, and *O. clathrata* at St. Keyne. *O. luteolata* is very common in most districts. *Diastictis wauaria* is occasionally obtained in the south-east of the county, but elsewhere has only been captured at Bodmin and Newquay. *Ectropis luridata* is recorded by Tellam from Dunmeer Wood, Bodmin, and has been taken near Altarnun. *E. punctularia* appears to be scarce, but specimens have been obtained at Liskeard, Bodmin, and from West Cornwall. *E. biundularia* is frequently taken between the Bodmin Moors and the Tamar and has been recorded from Bodmin and Newquay. *E. consonaria* appears to be limited to the district round Bodmin and Doublebois. A single specimen of *Deileptenia abietaria* was taken in the Looe valley in July, 1899, and one by Baily at Paul, Penzance, in the early eighties. *Gleora lichenaria* is generally distributed and locally common. *Selidosema repandata* occurs at Launceston, Bodmin, Newquay, Falmouth and Penzance. *S. glabraria* is occasionally obtained at Millook, Newquay, and Looe, and stray specimens have been taken along the south coast. *S. gemmaria* is widely spread along the south, but apparently very local in the north of the county. *Bupalus piniarius* is obtained occasionally about the pine plantations near the Tamar and around Liskeard. *B. atomarius* is widely spread and not uncommon. *Abraxas grossulariata* is the well-known currant moth. Though an abundant insect all through the county the mischief done by the larvae to gooseberry and currant bushes is not as a rule very pronounced. In the west the larvae are almost never seen on *Ribes* at all, but occur in abundance on *Euonymus*, pennywort, and blackthorn, and are occasionally found on ivy. Complaints are received now and then of its appearance on currants in the east of the county and at Bodmin, and larvae are occasionally sent in for identification. Except in 1900, the writer, however, has not seen a severe attack in the county. In 1903 the moth was fairly common at Tresco. A solitary example of *A. sylvata* was captured on a brilliantly-lit window of the bungalow at Millook in July, 1905. *A. adustata* is occasionally taken in the eastern half of the county, but is apparently scarce. *A. marginata* is widely distributed and in some seasons fairly common. *Pseudopanthera punctata* is sparingly scattered throughout the eastern woods and locally as far west as Penzance. *P. bimaculata* is captured occasionally in the south-eastern districts. Casual specimens

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occur at intervals along the south coast. *P. macularia* is at times plentiful in the east, but is scarce elsewhere. *P. obscuraria* is widely spread but local. *P. petrarica* is in some seasons not uncommon in the east, but apparently always scarce in the west. *Crocota strigillaria* has twice been taken near Saltash and once at Looe. *C. gilvaria* was captured at Bude in August, 1905. *C. ochrearia* has been obtained near Bosccastle, at Whitsand Bay East, at Bodmin, and at Penzance. *Theria rupicapra* is not infrequently taken in overgrown hedgebanks in the east and middle of the county, but is evidently rare in the west. *Hybernia leucophaea* occurs about Kilkhampton, Poundstock, Launceston, and Liskeard, and has been taken at Penzance by Marquand. *H. marginaria* is fairly common and generally distributed in the early spring. Three specimens of *H. aurantiaria* were captured by the Gannel several miles above Newquay in October, 1900. *H. defoliaria* is generally very scarce, but in 1899 the larvae attacked a number of gooseberry trees, black currants, and raspberry canes at Ludgvan, and so completely destroyed the leaves that they looked as if they had been scorched by fire. The same year larvae were sent in from Hayle and Camborne.

Apocheima pedaria is widely spread but scarce. *Biston hirtarius* has been taken near Kilkhampton, and was recorded by Cocks from Falmouth and by Marquand from Penzance. *B. stratarius* is occasionally found between the Bodmin Moors and the Tamar, and has been taken at Bodmin and at Penzance. *B. betularius* is generally distributed among the woods of the county. *Deilinia pusaria* is widespread but local, somewhat scarce in the north and at Scilly. *D. exanthemata* is generally distributed but scarce. At Scilly it has been captured several times.

Ourapteryx sambucaria occurs everywhere, and is locally plentiful. *Metrocampa prosapiaria* is common in the eastern pinewoods but rare in the west. *M. margaritaria* is of frequent occurrence throughout the county. *M. pulveraria* has been captured at Saltash, Looe, and Bodmin. *M. dolabraria* occurs sparingly near Altarnun and Trebartha, and has been recorded from Bodmin and West Cornwall. *Euchlaena prunaria* has been taken between Launceston and Altarnun, at Calstock, Looe, and Bodmin. *E. apiciaria* is widely spread, but local and usually rather scarce. *Selenia bilunaria* is generally plentiful in March and April, and again in July. It has been obtained by Jenkinson at Scilly. *S. lunaria* has been taken at Bude, Launceston, Looe, Malpas, Falmouth and Penzance. *S. tetralunaria* occurs sparingly near Altarnun and at Launceston, in the middle reaches of the Lynher, and at Looe. *Hygrochroa syringaria* is of frequent occurrence in the east, but is very rarely recorded west of Liskeard. *Colotois pennaria* was recorded by Marshall from East Cornwall and by Marquand and Baily from Penzance. It has been taken during the past five years at Bude, Callington, Saltash, Liskeard and Falmouth. *Ennomos erosaria* was locally plentiful in 1901 between the Bodmin Moors and the Tamar; it has not been recorded west of Liskeard. *E. fuscantaria* occurs among the oaks in Coomb valley, Kilkhampton, at Millook, and sparingly in the south-east of the county. Five specimens of *E. alniaria* were captured near Altarnun in August, 1901. *E. quercinaria* is occasionally taken in the east, and has been obtained by Marquand and by Baily in the Penzance district. *E. autumnaria* was recorded from East Cornwall by Marshall. *Gonodontis bidentata* has been taken sparingly along the south. *G. elingvaria* is widely spread but rarely common; it has been twice obtained at Scilly.

POLYPLOCIDAE

Habrosyne derasa is of frequent occurrence in the east and south-east, but scarce elsewhere, though it has been found as far west as Penzance. *Thyatira batis* is taken occasionally at sugar about Launceston, Liskeard, and Truro, and has been recorded from Calstock, Looe, and Penzance. *Palimpsestis duplaris* occurs sparingly in the larger woods of the east of the county, and at Liskeard and Doublebois. *Polyploca diluta* is evidently confined to the north-east of the county, where it has been occasionally taken about Kilkhampton, Bude, Millook and Launceston. A single example of *P. flavicornis* was taken near St. Germans in March, 1905. *P. ridens* is recorded by Marshall from the east, and has been taken lately near Altarnun. It is said to have been common once about Camborne.

SPHINGIDAE

Hemaris bombylifformis has been taken near Bude, at Saltash, at Budock Bottoms by Cocks, and at Penzance by Marquand. *H. fuciformis* is very scarce, but has been captured at Looe, Falmouth, and Penzance. *Macroglossa stellatarum*, the humming-bird moth, is generally distributed and common all over the mainland and at Scilly. *Deilephila porcellus*, though widely spread, is apparently nowhere common. It occurs near Altarnun and in the Plymouth district; and single specimens have been taken all along the south, and at Newquay, Padstow, and Bude. *D. elpenor* is commoner and more generally distributed. Formerly it was not uncommon at Enys, where the larvae fed upon buckbean (J. D. Enys). *D. celerio* was taken by E. P. Marquand in the Penzance district. An example of *D. nerii* in splendid condition was taken at a white phlox in the garden at Miramar, Tregoll's Road, Truro, early in October, 1901, and is now in the museum of the Royal Institution

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for Cornwall. Several examples of *D. lineata* were seen, and one taken over rhododendrons in Mount Edgcumbe Park, June, 1870, by W. J. Sturt (*E. M. M.* vii, 110). One specimen was captured at Truro by A. P. Nix in the late sixties. One was taken by Mr. Sanders on Pennance Hill, Falmouth (*vide* W. P. Cocks), one at Mawnan (J. D. Enys), and one at Penzance by E. P. Marquand. In 1905 several were recorded from the county. *D. euphorbiae* is a rare casual in Cornwall; it has been recorded by Cocks from Pendower Sands and by E. P. Marquand from the Penzance district, and is said to have been seen at Scilly. *D. galii* was first recorded from the county by J. R. Reading. On 26 August, 1870, an example was taken at Wendron by H. Anstey (*E. M. M.* vii, 139), and a worn specimen was captured at Paul in 1892.

Sphinx ligustri is of frequent occurrence all over Cornwall. *S. convolvuli* is taken in the county almost every year, but is usually very scarce. In certain seasons, like 1887, 1900, and 1901, it is abundant almost everywhere. In 1887 H. W. Vivian counted about forty specimens in worn condition at the flowers of *Nicotiana affinis*. It puts in an occasional appearance at Scilly, and H. Harpur Crewe reports it as common when he was collecting there. Though the species is not usually resident Baily says that larvae had been brought to him by boys on several occasions, and in 1901 they were frequently found in the Truro-Falmouth district and at Hayle.

Acherontia atropos, the Death's Head moth, is widely spread throughout the county, and is by no means uncommon. At Scilly it is of frequent occurrence. Larvae are frequently brought in from the potato-fields for identification. *Smerinthus populi*, though never common, is widely spread, and has been taken near Launceston, Altarnun, Plymouth, Liskeard, Bodmin, Newquay, Truro, Falmouth and Penzance. *S. ocellatus* is not taken so frequently, and does not appear to be so widely spread; it has been recorded from Bude, Plymouth district, Liskeard, Bodmin, Falmouth, Penzance and Lelant. *Dilina tiliae* is evidently limited to the east of the county, where it has been taken at Calstock and Mount Edgcumbe.

NOTODONTIDAE

A young larva of *Pygaera pigra* was found by Atmore on dwarf willow at Madron. *Notodonta ziczac* is not uncommon but somewhat local in East Cornwall, and has been recorded from Bude, Newquay and Penzance. *N. dromedarius* was fairly plentiful about Kilkhampton in 1901, but otherwise represented by solitary specimens taken at Millook, Launceston, Calstock and Liskeard. *Drymonia dictaeoides* has been taken once at Mount Edgcumbe and once at Looe. *D. tremula* is also very scarce, but was taken in 1904 at Saltash and Calstock, and had previously been recorded from Looe, Bodmin, West Cornwall, and doubtfully from Newquay. *D. trepida* has been obtained at Kilkhampton, Stratton, Millook, Launceston, Mount Edgcumbe, Doublebois and Bodmin, but is apparently a very scarce insect, as not more than twenty specimens are recorded during the last forty years. *D. trimacula* was taken in July, 1903, at Mount Edgcumbe. *D. chaonia* was taken at light near Millook in 1902, and had previously been reported from North Hill. *Stauropus fagi* has been recorded from Mount Edgcumbe, Antony Park, Liskeard and Withiel. One specimen of *Ptilophora plumigera* was taken by Thomas at Liskeard and is now in the Truro collection. *Pterostoma palpina* is sparingly spread over the east and south-east of the county, but does not seem to have been taken west of Bodmin. *Odontesia camelina* is equally scarce and has evidently a similar range. *Cerura vinula* is widespread, and in some seasons common; it has been frequently obtained at Scilly. *C. bifida* has been taken near Altarnun, at Liskeard, and Madron. Vivian records an old cocoon from Bosahan. *C. furcula* is also very scarce, but has been taken near Altarnun, at Landulph and Mount Edgcumbe. *Phalera bucephala* is widespread, and often common, but though frequently found in the larval stage on oak and elm is rarely in sufficient quantity to do much damage.

SATURNIADAE

Saturnia pavonia is widely distributed, but very variable in numbers. It was common in 1901 in several of the upland valleys on the east and south of the Bodmin Moors, and in 1905 was fairly plentiful near Newquay. A. E. White reported it in great abundance at Sancreed in the Land's End district in 1893, and F. J. Polkinghorne mentions that it was common about Bodmin in 1896. In most seasons it is taken frequently throughout the county, but is far from plentiful.

LASIOCAMPINA

DREPANIDAE

Cilix glaucata is generally distributed and of frequent occurrence in probably every district. One rather battered example of *Falkaria lacertinaria* was taken near Calstock in August, 1899. *F. falkataria* has been recorded from Coomb valley, Kilkhampton, from East Cornwall and from

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Bodmin. *Drepana binaria* was taken near Millook in 1902, and has been doubtfully reported from Doublebois. *D. cultraria* has been obtained by Thomas near Liskeard.

LASIOCAMPIDAE

Lasiocampa quercus is with its form *callunae* generally distributed and common all over the county, including Scilly. *L. trifolii* was plentiful about Whitsand Bay East till the early sixties, when it began to dwindle in numbers and gradually became extinct. It has been found by Marquand and by Baily in the Penzance district, chiefly in the larval stage, and was taken at light by Jenkinson at Scilly on 16 August, 1871. *Eriogaster populi* is not infrequently obtained in the south-east of the county, and has been once recorded from near Liskeard. *E. lanestris* is not uncommon, but extremely local. It occurs in the south-east of the county, at Falmouth, and somewhat sparingly at Penzance. *E. rubi* literally swarms at times on much of the Cornish cliff-land in the larval state, but is not often seen on the wing; it occurs all over the mainland, but has not been recorded from Scilly. Two specimens only of *E. crataegi* have been taken in the county one much worn at Mount Edgcumbe, and one in perfect condition above Liskeard. *Clisiocampa neustria* is generally distributed, but not usually plentiful, and therefore not so injurious to the leafage of orchard trees as it is on the continent. No serious attack has been reported since systematic records began seven years ago, though the larva is occasionally sent in for identification. *Odontestis potatoaria* is widely spread, and in places abundant. *Gastropacha quercifolia* is occasionally found in the east and south-east of the county, but is apparently scarce.

PYRALIDES

PHYCITIDAE

Anerastia lotella has been taken sparingly on the towans near Carbis Bay. It has also been reported from the sandhills at Bude. *Pempelia dilutella* has been often taken around the coast. *P. ornatella* seems to be confined to a little patch of cliff land between Millook and Crackington, and is rather scarce even there. *Salebria fusca* was recorded by Marshall and was obtained by Baily, but appears to be very local. *S. palumbella* has been taken just beyond the Fern Pits on East Pentire, Newquay. *Alispa angustella* is probably rare, as the only county record is one taken by Baily near Godolphin in June, 1895. *Hypochalkia abenella* was obtained by Marryat near Trevillis, Liskeard, 'in some numbers in a sloping grass field just beyond the railway to Looe.' *Phycita spissicella* is sometimes not uncommon in the early part of August among the oaks in Millook valley, and has been taken near Truro. *Plodia interpunctella* was captured on a grocer's window at Falmouth, in July, 1900, the only record for the county. *Ephestia elutella* has been taken by Atmore and by Baily in the neighbourhood of Penzance, and seems to be fairly common there. It also occurs at Falmouth, and in 1901 was very common about Truro. *E. ficulella* was obtained by Tellam at Bodmin in September, 1900. *E. kuehniella* occurred in some numbers in a bakery in Truro in July, 1902, evidently an introduction. *Euzophera cinerosella* was recorded by Marshall from the east of the county. *Homoeosoma sinuella* was reported by Fust, *H. binaevella* by Marshall from near Saltash, and *H. cretaceella* by H. Thomas from near Portscatho. *H. nimbella* bred freely from larvae found by F. Jenkinson in the heads of *Pyrethrum* on Great Ganilly, Isles of Scilly. *H. nebulella* appears to be scarce, but is recorded both by Fust and by Baily. *Eurhodope advenella* was taken by C. W. Dale at Penzance, and Baily found *E. suavella* fairly common near the Land's End. *Cryptoblabes bistriga* was obtained by Marshall at Botus Fleming, by J. J. Lory at Bishop's Wood, Truro, and by Atmore in the woods at Trevaylor valley, Penzance. *Acrobasis consociella* seems to be fairly common among the oak-lined valleys in the north-east of the county and along the south coast as far as Truro. *A. zelleri* has a similar distribution but is decidedly scarcer.

GALLERIDAE

Meliphora grisella is occasionally very destructive in old bee-hives about Truro, Falmouth, and probably elsewhere. In 1879 it was taken by Jenkinson at Scilly. Baily described *Melissoblaptes anellus* as abundant about Paul, but in all probability *M. bipunctatus* was the species referred to. *Aphomia sociella* is abundant all over the county, and at Scilly. *Galleria mellonella* is not uncommon about Truro, feeding on the comb in bee-hives. It is reported by Marshall from the east of the county.

CRAMBIDAE

Crambus hamellus was common at Falmouth till 1902, but has not been seen there since. *C. pascuellus* has been taken between Wadebridge and Bodmin, about Truro and near Penzance. *C. dumetellus* occurs at Millook, near Saltash, at Truro and at Penzance. *C. pratellus* and *C.*

A HISTORY OF CORNWALL

culmellus are evidently fairly common over the greater part of the county, and at Scilly. *C. hortuellus* occurs sparingly round Truro and was obtained by Marshall at Botus Fleming, by several collectors at Penzance, and by F. Jenkinson at Scilly. *C. craterellus* is apparently very scarce, as a single specimen obtained by Marryat near Looe is the only record for the county. *C. chrysonuchellus* has been taken by Tellam at Bodmin. *C. falsellus* has been obtained very sparingly in the Looe valley. *C. pinellus* has been recorded locally along the south of the county—at Botus Fleming, Bodmin, Truro, and Penzance—but is everywhere scarce. *C. latistrius* has only been secured by Marshall at Botus Fleming. *C. perlellus* is common in the southern half of the county and at Scilly, and has been taken at Millook and Newquay. Its variety *warringtonellus* is usually abundant near Penzance in the company of the type. *C. fascelinellus* was reported by Cocks as not uncommon about Falmouth, and the specimens he gave to the Royal Institution undoubtedly belong to this species. *C. inquinatellus* was taken by the Marquands about Penzance. *C. geniculeus* occurs near the Land's End and at Scilly. *C. tristellus* is common in the southern half, and local in the north of the county. Baily mentions a dark variety as appearing frequently at Paul. *C. selasellus* has only been recorded from the Land's End district. *Platypes cerussella* has been taken on several of the islands at Scilly by Jenkinson, who records a very red form from St. Helens. Howard Fox sent the writer a specimen of *Euchromius ocellus* that had been taken at Falmouth, but there is little doubt it had been accidentally introduced from the Mediterranean probably in the pupa stage.

PYRAUSTIDAE

Schoenobius forficellus has lately been fairly common about the Marazion marshes. *Cataclysta lemnata* is included in Cocks's list, but without specified locality. It has been taken at Coldrose Pool and also at Penwethers, near Truro, at Marazion and in the valley of the Gannel. *Nymphula stagnata* was represented till lately by a solitary specimen taken by Baily at West Penwith, but has been taken recently at St. Germans, Par, Wadebridge, and Truro. *N. stratiotata* has only been obtained by the Marquands near Penzance. *Hydrocampa nymphaeata* occurs sparingly from Bodmin westwards to Scilly, and along the valley of the Lynher and the Gannel. *Diasema litterata* has been taken occasionally near Budock. Mr. Boyd caught a specimen of *D. ramburialis* flying over a swamp near dusk at Probus on 16 June, 1858.¹ *Stenia punctalis* has been obtained only from Boscastle, from the Land's End district, and from Scilly. *Margaronia unionalis* must be regarded in the light of a casual immigrant only. It was captured at Scilly by Harpur Crewe.² The essentially Eastern Counties' insect *Agrotera nemoralis* was captured by A. H. Jenkin in West Cornwall. *Notarcha ruralis* is very common on nettles over the greater part of the county and at Scilly. *C. urticata* is also widespread, and as a rule abundant at Scilly. *Perinephela lancealis* has been taken not infrequently by Tellam between Bodmin and Padstow. Fifty years since it was common at Falmouth, but died out many years ago. A single specimen was taken in 1900 in the Poundstock district. *Phlyctaenia crocealis* is local but often abundant among *Inula dysenterica*. *P. lutealis* has so far been found only in the east of the county. *P. ferrugalis* occurs sparingly in the east of the county, and around Truro and Penzance. Among the Isles of Scilly it is common on Tresco, Tean, St. Mary's and St. Agnes. *P. prunalis* appears to be of frequent occurrence along the southern half of the county. *P. terrealis* has been taken by Tellam near Bodmin and by Marryat at Looe. *P. fuscalis* has been occasionally taken on the lower banks of the Tamar by Marshall and others. *P. sambucalis* is scarce, but has been obtained at Bodmin, Truro, Falmouth and Penzance. *Nomophila noctuella* in most years is common throughout the county. *Psammotis hyalinalis* is in some seasons common at Paul, Penzance, on the heads of Knapweed. *Pyrausta cingulata* seems to be rare, as so far only two single specimens have been taken, namely, one by Baily near Newlyn on the spikes of *Salvia verbenaca*, and one at Newquay. *P. nigrata* has been taken several times among the thyme on the side of Bridewell, Millook. *P. purpuralis* has been found at Launceston, Calstock, Botus Fleming, Bodmin, Falmouth, and abundantly near Trerryn and Land's End. The variety *ostrinalis* has been taken by Tellam at Bodmin, and was not uncommon in 1901 near Altarnun. *P. aurata* has been recorded for the county by Jenner Fust. *P. cespitalis* is abundant, particularly in West Cornwall and at Scilly. *P. olivalis* is common in old hedgebanks in the south-east, about Liskeard, and around Penzance, and occurs at least occasionally in the middle and north. *P. flavalis*, though usually looked upon as an east coast species, has been obtained in the county by Jenner Fust. *P. verbascalis* appears to have been captured in the west by Noye. It is difficult to understand how a casual immigrant like *P. nubilalis* should be found at Padstow, but it was undoubtedly taken there some years ago by that most reliable of collectors R. V. Tellam. *P. asinalis* was obtained in some numbers in the middle of July, 1901, at Pentewan, and in 1904 in several localities on the north coast. *Microstege pandalis* occurs sparingly on wood sage Bodmin. *Loxostege verticalis* was reported by Marshall from Botus Fleming. *Scoparia*

¹ *Intelligencer*, iv, 15.

² *Entomologist*, 1877.

INSECTS

resinea has been taken near Saltash, at Millook and at Padstow, but is evidently very local. *S. lineola* has been obtained at Looe, Bodmin, Penzance, and was found by Dale to be rather common at the Land's End. *S. angustea* is described by Dale as abundant at Scilly in October, 1870, but has not been recorded there subsequently. It has been taken lately at Looe and Gerrans. *S. murana* was found on Kilmaur above Trebartha in July, 1902, but does not appear to have been noted anywhere else in the county. *S. frequentella* has been obtained in the east of the county, and is occasionally seen about Falmouth, Penzance and Land's End. *S. crataegella* is recorded by Marshall from Saltash, and by Marquand from Penzance. In 1901 it was common at Newquay. *S. pallida* occurs near Calstock, and was found by Dale at the Land's End. In some years it is common at Falmouth, and has been reported from Looe, but is irregular in its appearance. *S. cembrae* was recorded by Jenner Fust, and has been captured near Poundstock. *S. dubitalis* is fairly common throughout the county. *S. ambigualis* is abundant near Penzance, and frequently seen about Falmouth, Truro, Bodmin and Liskeard. *Mesographe forficalis* is abundant throughout the county, especially in gardens.

PYRALIDIDAE

Endotricha flammealis is widely distributed, but everywhere scarce except at Scilly. *Pyralis farinalis* is widespread and locally abundant. *Aglossa pinguinalis* is plentiful in outhouses and stables. *Synaphe angustalis* has been taken near Looe, at Mevagissey, and on the Isles of Scilly.

PTEROPHORIDAE

Oxyptilus parvidactylus was obtained by Baily near Godolphin, and appears to have been bred by him from larvae on mouse-ear hawkweed. The very scarce and local *O. hieracii* was taken by Marshall at Botus Fleming. *Platyptilia acanthodactyla* was common about Newquay, especially in the valley of the Gannel, in 1903, and has been taken once at Padstow. *P. gonodactyla* was taken sparingly by Baily about Paul, Penzance, and *P. zetterstedii* is represented by two specimens from the same locality in the same collection. *P. isodactyla* is also very rare, being recorded only from Heligan near Mevagissey by C. Perkins. *P. bertrami* has a wide distribution, but appears to be scarce everywhere. *P. ochrodactyla* is local and nowhere common. It was taken at Trebartha by J. D. Enys in July, 1902, and has been recorded from Botus Fleming and from Penzance. *Pterophorus tetradactylus* is common locally on the north coast and has been taken near Penryn. *P. baliodactylus* appears to have been taken by Cocks at Falmouth. *P. pentadactylus* is abundant throughout the county and at Scilly, especially in gardens. *P. galactodactylus* is occasionally found in the north-east on burdock, but does not seem to have been taken since 1902. *Marasmarcha phaeodactyla* has been taken by several collectors near Perranporth on restharrow, and was found in 1902 at Whitsand Bay east. *M. microdactyla* has so far only been found in the east of the county, and appears to have its headquarters near Launceston. *Alucita tephrodactyla* occurs close to Liskeard, and has been taken at Mawgan-in-Pyder. *A. monodactyla* is generally distributed from the Tamar to Bodmin, is rare about Truro, but common at Paul and in one or two other localities in the Penzance district. *A. lithodactyla* was taken by Atmore among *Inula dysenterica* in the same neighbourhood and by Norgate at Tresco, Scilly. *Stenoptilia pterodactyla* was recorded by Marshall for East Cornwall and has also been obtained by Norgate among the 'Western Isles.' The local *S. zophodactyla* is described by Baily as frequent in the Land's End district, and its variety *plagiodyctylus* has been found by the same entomologist at St. Levan.

ORNEODIDAE

Orneodes hexadactyla in favourable seasons may be abundant all over the county as in 1902. In other years, as in 1904, it is, locally at least, very scarce.

PSYCHINA

ZEUZERIDAE

Zeuzera pyrina is very scarce and is probably only a casual. The only county records are one in a list sent by A. Rashleigh to Baily when the latter was preparing his article on Cornish Lepidoptera, and one taken on the Lynher in 1900.

ZYGAENIDAE

Zygaena filipendulae is commonly met with on low-lying marsh-land throughout the county. *Z. loniceræ* is only occasionally found in the east, but is fairly common from Bodmin westwards.

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Z. trifolii is very local, but usually abundant where it occurs. *Pocris statices* is common but local, in open places, meadows, and near woods in the south-east of the county. It is not infrequently met with about Truro, and is common at Godolphin.

TORTRICINA

EPIBLEMIDAE

Chrosis littoralis seems to be abundant in most situations on the coast where thrift is plentiful, including Scilly. *Bactra lanceolana* is among rushes usually one of the commonest of insects in May and June. *B. furfurana* has been taken among reeds in East Cornwall and at Swanpool. *Eucosma bartmanniana* has been reported from the woods on the right bank of the Tamar in July. Two specimens of *E. betuletana* were taken by Perkins at Heligan, near Mevagissey. *E. variegana* is generally distributed along the south, and common in woods and lanes. *E. ochroleucana* is common in woods and in tall hedgebanks in the east, but has not been recorded for the west. *E. pruniana* is abundant, but somewhat local. The last two species when at rest closely resemble the droppings of birds. *E. oblongana* is apparently rare, as a single specimen taken by Atmore near Penzance and one in the Lynher valley are the only county records. *E. sellana* is recorded by Baily from Paul, near Penzance, and *E. dimidiana* by Marshall from Botus Fleming. *E. nigricostana* has been taken by Peter in the neighbourhood of Launceston. There is a record for *E. rupana* from Liskeard, but it is almost certainly in error for *E. purpurana* which has been taken there. *E. urticana* is common but local in the southern half of the county. *E. lacunana* is fairly general about open woods and along country roads with broad bramble-covered margins. *E. bifasciana* was taken in Bishop's Wood, Truro, by J. J. Lory in July, 1901. *E. striana* was captured frequently by Cocks at Falmouth, but has not been seen there for the last forty years. *Evetria buoliana*, though usually scarce, has occasionally done a good deal of damage to *Pinus insignis* in different parts of the county by mining into the young shoots. *E. pinivorana* attacked some young *Pinus sylvestris* in similar fashion near Liskeard a few years ago. *Enarmonia cruciana* is common in the woods and willow clumps in the east of the county, but has not been found west of Bodmin. *E. nanana* was caught by Baily near Godolphin, and two specimens of *E. pinicolana* were taken by the same entomologist near Land's End. *E. corticana* is also rare, and probably confined to the district round Botus Fleming, where Marshall caught three. *E. woerberiana* is local, and fortunately nowhere common as yet. It has been taken in orchards about Callington, Truro, Penzance and Newquay. *Tmetocera ocellana* is common in thick hedgebanks and in tree clumps in the south-east of the county, and as far west as the Looe valley. It was common in 1901 at Heligan, Mevagissey. *Eudemis naevana* has a wide distribution, but is generally scarce. Atmore found it common at Penzance, and in 1904 it was plentiful at Newquay. The beautiful *Ancylus derasana* is rare, but has been taken along the right bank of the Tamar. *A. lundana* has only been recorded from the Looe valley. *A. biarcuana* has been occasionally found on the banks of the Gannel. *Gypsonoma dealbana* has been obtained by Marshall in East Cornwall. *G. neglectana* occurs somewhat sparingly at Cotehele. *Cydia obtusana* has been obtained several times among oaks in the east and north-east of the county. *C. trimaculana* has been taken in the woods at Doublebois, and *C. ramella* has been found by Tellam at Bodmin. *C. achatana* was recorded by Cocks at Falmouth, and there is a specimen marked 'Penryn' in the museum of the Royal Institution of Cornwall at Truro. *C. strobilella* was obtained by Marshall in the east of the county, and *C. nigromaculana* was taken by Peter in the neighbourhood of Launceston. *C. citrana*, generally regarded as belonging to the eastern and northern districts of England, was found in abundance at Scilly by Jenkinson in 1877. A solitary specimen of *C. pupillana* was taken by Price on *Artemisia* near Fowey. About half a dozen specimens of *C. aemulana* were seen over a clump of golden rod, and two secured by E. Pearce at Pencalenick early in July, 1902. *Notocelia uddmanniana* is evidently distributed throughout the whole county, including Scilly, but is nowhere common. *N. rosaeolana* was taken on sweet-briar not far from Callington in June, 1905. *N. trimaculana* is widely distributed on hedgebanks and in gardens, but it is seldom one sees more than five or six even in a favoured locality in the course of the season. *N. roborana* is somewhat local, occurring rather sparingly in broad hedges, tangled copses and open woods near the Tamar, and about Liskeard, Falmouth, Penzance and Wadebridge. For three seasons now there has been a colony of *N. incar-natana* in the Restormal valley, near Lostwithiel. *Epiblema tripunctana* occurs in the oak woods about Millook, in the gardens at Flushing and Penzance, and probably elsewhere. *E. subocellana* is taken occasionally in the east of the county. A fine specimen of *E. penkleriana* was captured among the hazels near Kilkhamp-ton about the end of June, 1902. *E. nisella* was reported by Marshall as scarce about Botus Fleming, and has been obtained at sal-low up the Lynher valley. *E. immundana* was taken at Heligan, near Mevagissey, in May, 1901, and near the Tamar in April, 1904.

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E. tetraquetra has been reported by Baily from Paul, and a single specimen was captured at Boscastle. *E. similana* was taken by Pearse near Doublebois. *E. pflugiana* was found by Marshall in the east of the county, and was fairly common about Stratton in June, 1904. *E. brunnichiana* was obtained by Tellam near Withiel a few years ago, and is said to be plentiful at times in that neighbourhood. *E. turbidana* was taken by Marshall at Cargreen, and has occurred near Bude. Three examples of *E. bilunana* were captured by Baily at Paul. *E. solandriana* was found by Marryat at Looe, and has been reported from Newquay. *E. semifuscana* is not uncommon locally in the east and south-east of the county. *E. scopoliana* and *E. cana* were taken sparingly round Penzance by Atmore. *Hemimene alpinana* has been sent in from Liskeard. *H. petiverella* is generally distributed and fairly common all over the county, including St. Mary's and Tean, Scilly. *H. simpliciana* occurs near Newquay, and in 1902 was common. Atmore took *Lipoptycha plumbana* near Penzance, and it was found last year at Wanson Mouth, Bude. *Pammene rhediella* is not uncommon in the east about hawthorn, but is a rare casual elsewhere. Two specimens of *P. splendidulana* were seen and one captured at St. Germans in May, 1902. *P. argyrana* is at times fairly common on broad hedges and the outskirts of woods in the east of the county, but apparently unknown in the middle and west. *P. spiniana* appears to be widely distributed, but somewhat local and scarce. It has not been reported west of the Falmouth district. *P. regiana* was found by Atmore sparingly on the trunks of sycamores about Penzance. Atmore took a single specimen of *Laspeyresia ianthinana* near Penzance in July, 1886. *L. perlepidana* is represented by two somewhat worn specimens taken by Pearson near Hayle. *L. internana* appears to be confined to East Cornwall, where it has been obtained by Marshall and others. The larvae of *L. compositella* appeared on some seeding clovers in the neighbourhood of Wadebridge in 1897, but has not been seen there since 1901. The damage was very slight, and confined to a few small patches. *L. nigricana* is widely distributed over the eastern part of the county, but is rather scarce. It has not been taken west of Liskeard. *L. leguminana* was obtained several times at Falmouth by Pearson and others between 1899 and 1902. In some seasons *L. ulicetana* is most abundant about furze throughout the county, including Scilly. In 1904 it was remarkably scarce, but was very plentiful in 1905. *Carpocapsa pomonella*, the codlin moth, is in some years one of the most destructive pests on the apple crop in the county. The females appear about the middle of May or a little later, and attach their eggs for the most part singly to the skin of the swelling fruit. The emerging caterpillars eat their way straight to the core of the young apple. Though often abundant this moth is not much seen on account of its retiring habits. The larvae of *C. splendana* are occasionally plentiful in acorns in the north-east and east of the county, and have been found as far west as Falmouth. Beech nuts are at intervals attacked by the larvae of *C. grossana*, but the insect is rarely taken. *Epinotia aurana* is not uncommon throughout the county on the outskirts of woods and the broad overgrown margins of country roads. *E. albersana* has been bred at Truro from larvae taken in the folded leaves of honeysuckle. Plums have been twice sent in from the east of the county containing the larvae of *E. funebrana*. *E. hypericana* was taken by Baily on more than one occasion about Penzance.

TORTRICIDAE

Rhacodia caudana is generally distributed about woods and streams throughout the county, but is rather scarce. *Acalla cristana* occurs locally as far west as Doublebois and Newquay. The beautiful variety *fulvocristana*, Steph. has been taken on the banks of the Lynher. *A. bastiana* is evidently scarce, but has been thrice taken in the neighbourhood of St. Germans. *A. rufana* is occasionally obtained in dense irregular hedgebanks about Saltash and Callington, and *A. sponsana* appears to favour the deep lanes of the same district, especially in the vicinity of Ellbridge. *A. literana* has been found very sparingly in woods by the side of the Tamar and about Poundstock. *A. boscana* has been taken in the gardens along Tregoll's Road, Truro, and near Penzance. *A. mixtana* seems to be limited to the Luxulian valley. *C. logiana* is represented by two specimens of the variety *trigonana*, taken by Baily at Paul in 1893. *C. variegana* is generally distributed, and as a rule common along hedgebanks and narrow strips of wood. *C. permutana* was reported from East Cornwall by Marshall. *A. schalleriana* is scarce and evidently local. It has been recorded from the east of the county, from Truro and from Penzance. One specimen of *A. comariana* was taken and several seen by Ilott over a strawberry bed at Nance, near Truro. *A. contaminana* appears almost everywhere about the Tamar and Lynher, and Baily reports three specimens from the Land's End district. A pale form seems to replace the type about St. Germans. *A. ferrugana* has been reported twice from birches in the upper Tamar district, and one was captured last year in the Lynher valley. *A. aspersana* has been recorded by Jenkinson from Scilly. *A. bolmiana* is generally distributed and common along well-covered hedgebanks and in neglected orchards. Two specimens of the northern species *Philedone gerningana* were taken by Baily at Paul. The very local *Epagoge grotiana* is recorded by Marshall from the east, and by Jenkinson from Scilly. *Capua angustiorana*

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is a local but abundant species along broad hedgebanks, in thickets and in gardens from Bude to Callington and Liskeard. A solitary example of *C. favillaceana* was taken at Mount Edgcumbe in May, 1900, and it has been reported from Menheniot. *Sparganothis pilleriana* was taken by Marshall on the south coast. *Cacoecia piceana* has been captured by Tellam at Bodmin. *C. podana* is generally distributed and plentiful on hedges and in gardens. *C. crataegana* is local, and evidently nowhere common. It has been taken lately at Millook and at Bishop's Wood, Truro, and has been reported from Bodmin and Paul. *C. xylosteana* occurs sparingly on hedgebanks and in country lanes between the Tamar and Liskeard. *C. rosana* is occasionally taken in the southern half of the county from the Tamar to Penzance. *C. sorbiana* is found in most years between Doublebois and Bodmin. *C. costana* has been taken twice in the Wadebridge district. *C. unifasciana* is common about Launceston, especially in gardens, and occurs at intervals along the south of the Bodmin moors and in the Land's End district. In 1905 it was abundant at Boscastle. *C. lecheana* is reported by Marshall as of frequent occurrence in East Cornwall, and *C. musculana* was taken by Marryat near Looe, and was recorded last year from Newquay. *Pandemis corylana* and *P. heparana* are common along the Tamar and west to Bodmin and Lostwithiel. *P. ribeana* is found in country lanes and gardens all over the county, but is usually somewhat scarce. *P. cinnamomeana* has been taken by Tellam at Bodmin, and by Baily at Penzance. *Tortrix forskaleana* occurs plentifully some years along Tregoll's Road, Truro, the last year of abundance being 1902. It was reported by Cocks from Falmouth. *T. bergmanniana* is local but widely spread, and common in some of its haunts. It has lately been abundant about Launceston. *T. ministrana* is fairly common as a rule in the east and about Boscastle. *T. conwayana* occurs sparingly along the southern half of the county, and is at times plentiful in the Land's End district. *T. loeflingiana* is common in country lanes and thickets as far west as Doublebois. *T. viridana* appears in numbers every now and then on oaks all through the county, but in a general way is rather scarce. In 1901 some oaks at Doublebois were badly attacked by the larvae of this species, and in 1905 a clump at Millook was disfigured by them. *T. paleana* was hatched out of caterpillars on plaintain gathered near Malpas. *T. viburniana* is abundant locally in some seasons in the east of the county. Odd leaves of ivy are not infrequently skeletonized in the neighbourhood of the Tamar, about Liskeard, and more rarely in the middle and west by the larvae of *C. forsterana*. *T. politana* was bred from larvae found by Miss Snell on *Myrica gale* near Shortlanesend, Truro. *T. chrysanthemana* was taken by Cocks at Falmouth many years ago. In July, 1900, Pearson took three near Pendennis Castle. *T. virgaureana* is rare in East but abundant in West Cornwall when the season is favourable. *T. incertana* is common in luxuriant hedgebanks and thickets nearly all over the county. *T. nubilana* is somewhat scarce in hedges between Mount Edgcumbe and the Looe valley. *T. pascuana* occurs not infrequently in the Land's End district. *T. conspersana* has been taken by Atmore near Land's End, and by Adkin at Scilly. *T. longana* is evidently very local. It was taken by Marshall at Botus Fleming, by Baily near Penzance, and was bred from Scillonian specimens of *Silene inflata* by Adkin. *Isotrias hybridana* is rare, but has been obtained by Marshall in East Cornwall, and by Cocks at Falmouth. *Cheimatophila tortricella* is common among oaks at Millook, and evidently all over the district between the Tamar and the Bodmin moors in February and March. It is apparently common in the middle and west, but the earliness of its emergence probably causes it to be overlooked.

PHALONIADAE

Lozopera francillana has been bred from larvae found among the seeds of wild carrot near St. Clement, Truro. *L. dilucidana* was captured at Scilly by Jenkinson. *Phalonia badiana* is widely spread, but everywhere scarce. *P. cnicana* has been bred from thistles collected at Altarnun. *P. tessera* is occasionally taken about Liskeard where wood gives way to down-land. *P. vectisana* has been bred from the heads of sea-plantain gathered at Padstow, and *P. ciliella* from the heads of cowslips at Hayle. *P. udana* has been captured several times by a tiny pond in the valley of the Gannel. *P. nana* appears to be confined to a few birches in the Upper Tamar district. *P. atricapitana* has been bred several times from ragwort from the middle and north of the county, and *P. pallidana* from the heads of sheep's-bit at Truro. *Eupoecilia maculosana* was raised from larvae found in the seed-pods of the wild hyacinth at Pencalenick by Miss M. O. Gregg. *Anisotaenia ulmana* has been caught a few times about Hayle. Larvae presumably of this species have been found several times in folded leaves of the lesser celandine, but have not so far been successfully reared. *Euxanthus angustana* has been taken in woods near South Hill, Callington. *E. straminea* was found locally abundant by Atmore in the Penzance district among the heads of knapweed. *E. zoegana* is very local; it has been taken at Altarnun, at Bodmin and at Bishop's Wood, Truro, and was found by Baily to be plentiful on cliffs near Land's End. *E. hamana* is not so local, occurring more or less regularly over the east and south of the county. *Hysterosia inopiana* was found by Atmore about Penzance among *Inula dysenterica*.

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TRYPANIDAE

Trypanus cossus, the goat-moth, is never common or even frequent in any part of the county, but captures of one or more caterpillars have been recorded from time to time from Botus-Fleming, Mount Edgcumbe, Antony, Liskeard, Looe, Bodmin, Tregothnan, Falmouth, St. Clement, and Boscastle.

TINEINA

AEGERIADAE

Aegeria apiformis is rare ; it has been taken by Cocks near Falmouth, by Marquand in the Land's End district, and by Lory at Bishop's Wood, Truro. *A. crabroniformis* has been obtained by Baily and by Marquand in West Cornwall, the former describing it as not infrequent. *Trochilium tipuliforme* is common in many gardens among the currant bushes all over the county. *T. asiliforme* is very scarce, and has been recorded only from Mount Edgcumbe and from Bodmin. *T. ichneumoniforme* is widespread, but apparently local ; it occurs on grassy slopes near the coast at Whitsand Bay, Bedruthan steps, Swanpool, and Penzance. The very local thrift clear-wing, *T. musciforme* (*philanthiforme*) was simultaneously discovered on the English mainland by King at Bolt Head, Devon, and by Reading at Whitsand Bay. It is now widely spread round the Cornish coast, and may be reasonably looked for wherever thrift is abundant. On the north coast it is not uncommon from Bude to Padstow, and Goss writes that it was plentiful in 1902, especially on the coast about Dizzard Head between Millook and Crackington Haven.

GELECHIADAE

Paltodora cytisella has been recorded by Marshall from East Cornwall and by Jenkinson from Scilly. *Aristotelia stipella* has also been taken by Jenkinson at Scilly, but has not been identified on the mainland. *A. brizella* was captured on thrift at Whitsand Bay east in 1902, and in the following year larvae were found in the heads of thrift on Annett, Isles of Scilly, that agreed with Meyrick's description of this species, but they died before pupation. *A. tenebrella* has been taken by Jenkinson at Scilly. *A. arundinetella* was recorded by Marshall from East Cornwall ; and so, too, was *Stenolechia gemella*. *Epitactis mouffetella* occurs very sparingly about St. Germans on honeysuckle. *Anacampsis taeniolella* was not infrequently taken about Falmouth in the first week of July, 1901. A solitary specimen of *Xenolechia humeralis* was taken by Marryat near Looe in 1890. *Gelechia domestica* is occasionally not uncommon in the southern districts among mosses on hedgebanks and old walls ; it was plentiful at Newquay in 1903. *G. umbrosella* is recorded by Jenkinson from Scilly. *G. affinis* is probably widely spread, but has only been noted on moss and lichen-covered patches of hedgebank about Truro and Falmouth. *G. mundella* is reported by Jenkinson as abundant at Scilly. *G. desertella* was also taken on the islands by the same collector, but Stainton did not consider the specimens quite normal. *G. terrella* is very local on short grass in the east of the county, but usually plentiful within the area of occurrence. *G. acuminatella* was taken, probably by Marshall, on thistles near Cargreen. *G. artemisiella* was obtained by Atmore at Penzance among wild thyme. *G. plantaginella* was fairly common about Maenporth in 1900. *G. instabilella* was first observed in Great Britain by Boyd, who found the larvae at the Lizard ; at present it is not uncommon in the west, and has been found at Scilly. *G. ocellatella* is recorded in Stainton's *Manual* for the Lizard, and has been taken at Scilly by Jenkinson. *G. maculea* has been bred from larvae found on the capsules of stitchwort in Restormel valley near Lostwithiel. *G. tricolorella* was not uncommon near Trerice, Newquay, in July, 1902. Three specimens of *G. maculiferella* were captured somewhere between Doublebois and Wadebridge on 16 July, 1903. *G. marmorea* has so far been recorded only from Scilly, where in some seasons it is common. The larvae of *G. leucomelanella* were found mining in shoots of *Silene maritima* at the Lizard by Boyd. *G. luculella* was taken by Marshall in East Cornwall. *G. scriptella* has been hatched from larvae found by Miss Snell in folded leaves of the maple near St. Agnes. *G. vulgella* is occasionally beaten out of blackthorn hedges about St. Burian. One specimen only of *G. nigra* has been taken, namely, by Baily, at Paul. *G. sororculella* occurs sparingly about St. Germans and Botus-Fleming. *G. rhombella* has been taken, at least occasionally, about North Hill. *G. solutella* is recorded for the Lizard in Stainton's *Manual* ; three specimens were taken near Caerhayes in 1901, and are now in the Royal Institution Museum at Truro. *G. diffinis* is reported only from Liskeard and Scilly, but has doubtless been overlooked. *G. velocella* was taken by Thomas near Perranporth. *G. mulinella* is described by Atmore as common on furze about Penzance, and *Tachyptilia populella* by Cocks as not uncommon in the neighbourhood of Falmouth. *Ypsolophus schmidtellus* is represented by a solitary example taken in a garden near Bodmin. *Chelaria huebnerella* is evidently

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widely distributed but scarce among the woods in the east of the county. *Symmoca quadripuncta* has twice been sent in from Falmouth, where it may have been introduced.

OECOPHORIDAE

Carcina quercana was reported by Marshall as abundant in East Cornwall. In 1905 it was common in several of the oak woods in the north-east of the county, at Liskeard, and at Doublebois. One specimen of *Ghimabache phryganella* was taken by Baily at Paul near Penzance. *C. fagella* is in most years sparingly scattered in the woods along the southern half of the county. *Depressaria costosa* is probably widespread, but is most plentiful among furze in the west and at Scilly. *D. umbellana* occurs about Truro and in the Land's End district, and was taken in 1904 at Boscastle. *D. assimilella* has been taken about Menheniot. The larvae of *D. liturella* were found by Atmore on the heads of knapweed about Penzance. *D. arenella* is locally abundant throughout the county. *D. propinquella* occurs in Marshall's list, and has been taken lately near St. Germans and at Boscastle. *D. subpropinquella* was captured in the Land's End district by Dale. *D. hypericella* is in Baily's list from Godolphin. *D. ocellana* is nowhere common, but has been taken on the Lynher and on salallows near Truro, and has been reported from the Gannel near Trevemper Bridge. Three examples of *D. yeatiana* were obtained by Baily at Paul. *D. alstroemeriana* is often plentiful on hemlock throughout the county. The larvae of *D. angelicella* are often abundant in the west, and especially about Hayle, in the screwed-up leaves and tops of angelica; the moths themselves are at times common. *D. purpurea* is of frequent occurrence in the east, but rare in the west; in 1901, however, almost every plant of common chervil on the south side of Bishop's Wood, Truro, was attacked by the larvae. *D. ciliella* is widely distributed in the county, but is probably local. *D. applanata* has also a wide range, and is in places very common. *D. rotundella* has been taken at the Land's End by Dale, and at Looe by Thomas. *D. badiella* was obtained near the Land's End by Dale and subsequently by Baily. *D. chaerophylli* is occasionally seen about Liskeard, and has been captured at Looe. *D. pimpinellae* was taken by Jenkinson at St. Mary's, Scilly, in 1877, and in the Looe valley in 1904. Atmore found the larvae of *D. pulcherrimella* sparingly on the umbels of *Bunium flexuosum* at Penzance. *D. heracliana* is widely distributed, and on the whole common; it is well established at Scilly. *D. nervosa* is abundant in the Land's End district, and has been taken at Truro and at Newquay. *Harpella geoffrella* is not uncommon in overgrown hedges in East Cornwall. *Oecophora olivella* occurs occasionally as far west as Falmouth, but is evidently scarce. *O. sulphurella* is common locally along the south and abundant in the west and in Carnanton Woods, St. Columb; it has also been taken at Scilly. *Acompsia lambdella* has been bred from full-fed larvae found on dead gorse at Perranporth. *A. angustella* has been taken between Launceston and Callington, and *A. minutella* at Looe; while a single example of *A. tripuncta* was captured by C. U. Tripp near Altarnun. *A. unitella* was fairly common to the south of Liskeard in 1901. *A. panzerella* has been taken by Marshall about Botus-Fleming. *A. pseudo-spretella* occurs over the whole county, including Scilly, and is often abundant in outbuildings. *A. fuscescens* is locally fairly common in the east and at Scilly, and has been taken at Truro.

ELACHISTIDAE

Several specimens of *Coleophora fabriciella* were captured on St. Mary's, Scilly, in July, 1903, and one in the Lynher valley the same year. One specimen of *C. deauratella* was obtained by Baily near St. Burian. *C. albitarsella* has been bred from larvae found by Tregelles on ground-ivy at Perranwell. In 1904 the larvae of *C. alcyonipennella* were common on knapweed on the Scawswater road, Truro. *C. nigricella* has been taken by Atmore at Penzance and by Jenkinson at Scilly. *C. gryppipennella* has been bred from larvae found on the leaves of the wild rose near Ellbridge. The larvae of *C. viminetella* were abundant on willows near Truro in 1900. *C. fuscadinella* has been bred from larvae on hazel from Kilkhampton. In 1905 they were abundant on the elms in Tregoll's Road, Truro. A single example of *C. lutipennella* was taken by Perkins at Heligan. Colonies of the larvae of *C. solitariella* are not uncommon in the east and north-east on stitchwort, but are rarely seen in the west. *C. laricella* is fortunately not so abundant anywhere in the county as to do very serious damage to the larch woods, but occasionally one sees the delicate young needles turning brown and the portion of a tree putting on the scorched appearance that is characteristic of its attack. *C. juncicolella* is not uncommon near Altarnun. *C. anatipennella* is occasionally taken about Falmouth and Penzance. The larvae of *C. ibipennella* are not uncommon occasionally on birches in the Upper Tamar district, but they are difficult to rear. *G. currucipennella* has been taken by Tellam near Bodmin Road station. The larvae of *C. discordella* were common at Tresco, Scilly, in 1879, and those of *C. lineolea* on black ballot in the Poundstock district in 1904. *C. niveicostella* has been

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taken on Bridewell near Millook. *C. troglodytella* was found by Atmore among *Inula dysenterica* about Penzance. *C. argentula* has with difficulty been bred from larvae on the seeding heads of yarrow from Ruan Lanihorne. *C. laripennella* has been found by Jenkinson on St. Agnes, Scilly. The larvae of *C. murinipennella* were in July, 1902, abundant on *Luzula campestris* near Trebartha. Those of *C. caespititiella* are usually common all over the county on seeding rushes. Larvae of *C. alticolella* were fairly common on the fruits of several clumps of *Juncus supinus* near Millook in September, 1905. *Elachista albifrontella* has been taken about the Helford river and about Penzance, and *E. luticomella* by Atmore at Penzance only. *C. atricomella* was reported from East Cornwall by Marshall. Two specimens of *E. subnigrella* were taken in 1890 by Marryat near Looe. *E. nigrella* was taken by Marshall in the east, and doubtfully by Jenkinson at Scilly. *E. bedellela* occurs on the downs near Chapman Head, west of Millook. *E. obscurella* has been taken in meadows at Grampound. *E. zonariella* occurs on marshy land at Par. *E. megerlella* was fairly common near St. Ewe in 1901. *E. disertella* has been obtained by Allen near Poundstock. *E. dispunctella* has been bred with difficulty from larvae on *Brachypodium sylvaticum* gathered near Mawgan Porth. *E. rufocinerea* is apparently the commonest member of the genus in the south-east of the county, but is scarce elsewhere. *E. cygnipennella* is generally distributed along the south as far as Penzance. The larvae of *Anybia epilobiella* are often common in the leaves of enchanter's nightshade about Truro and elsewhere. *Chrysoclista aurifrontella* is widespread but probably local; it has been taken at Launceston, Liskeard and Truro. *C. atra* was reported by Marshall from East Cornwall, and is fairly common about Penzance. *Mompba subbistrigella* has been taken at Bishop's Wood, Truro, but larvae are not infrequently found in the seed-pods of *Epilobium montanum* that evidently belong to this species. *Heliozela sericiella* was plentiful at Maenporth in 1899, and has been taken beyond Scawswater, Truro. Larvae were common in blotches on the leaves of dogwood at Bodmin in 1901, which probably belonged to *Antispila pfeifferella*. *Perittia obscuripunctella* is common in overgrown hedges about Calstock, and the blotches made by its larvae in the leaves of honeysuckle are not infrequently seen as far west as Falmouth and St. Agnes. In February, 1900, the webs of the larvae of *Scythris grandipennis* were abundant among some furze on the border of Carnon Downs. Specimens of the moth have been taken throughout the county. *Endrosis lacteella* is very common in houses almost everywhere. *Schreckensteinia festaliella* is fairly common among bramble-covered hedgebanks and in open thickets with tangled undergrowth about St. Tudy and Wadebridge. *Epermenia chaerophyllella* is common about Hayle.

PLUTELLIDAE

Prays curtisellus is widely scattered but apparently nowhere common in the east of the county. *Yponomeuta evonymellus* was reported by Marshall as frequent about Botus-Fleming. *Y. cognatellus* was taken by Dale near the Logan rock, and by Jenkinson at Tresco. *Y. padellus* is generally distributed and often abundant; it occurs at Scilly. *Y. plumbellus* is not infrequent in South-east Cornwall and occasionally elsewhere. *Orthotaelia sparganella* was taken by Cocks at Falmouth, and still occurs at Swanpool. *Cerostoma caudella* has been taken occasionally round Truro. *C. xylostella* is usually abundant but irregular in the east, about Truro, and around Penzance. *C. nemorella* has been captured by Baily near Penzance. *C. lucella* is rare, and has only been taken twice at Calstock. *C. alpella* has been taken near Bude. *C. sylvella* is scarce between the Tamar and Bodmin Moors. *C. costella* is generally distributed and common about woods west to Liskeard and Looe. *C. radiatella* occurs commonly in the eastern woods, and occasionally about Truro. *C. vittella* is usually common in country lanes and thickets in the east, and appears to die out about St. Austell. The larvae of *Plutella porrectella* were found on sweet-rocket by Baily at Paul, who records an emergence on 5 May. *P. cruciferarum* is abundant in most seasons all over the county. *Glyphipteryx fuscoviridella* is very common in the west, but scarce in the east, and at least local in the north. *G. thrasonella* seems to be everywhere plentiful where rushes grow. *G. fischeriella* was common about St. Germans in 1902. *Choreutis myllerana* was taken by Cocks at Falmouth and by Atmore at Penzance. *Simaethis pariana* was taken by Marshall in the east of the county. *S. fabriciana* is very common at times as far west as Doublebois.

TINEIDAE

Nepticula pygmaella was obtained by Marshall near Botus Fleming. The larvae are occasionally found about Truro. *N. atricapitella* has been bred from larvae collected in oak leaves at Doublebois, *N. anomalella* from larvae in rose leaves, and *N. viscerella* from elm leaves, taken near Truro. *N. oxyacanthella* was reported by Marshall from East Cornwall, and has been bred from hawthorn leaves at Liskeard. The larvae of *N. aurella* are abundant in bramble leaves everywhere. *N. gratiosella* has been bred from leaves of the whitethorn. Larvae of *N. marginicolella* are common in the leaves of the elm about Truro, Falmouth and Penzance. *N. alnetella* has been recorded from St. Germans.

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N. microtheriella has been bred from hazel leaves taken near Kilkhampton, *N. betulicola* from birch leaves about Bodmin, and *N. plagicolella* from blackthorn leaves from St. Burian. *N. luteella* has been obtained from the Upper Tamar district, and *N. argentipedella* has been raised from birch leaves from the same locality. Larvae of *N. salicis* are in some seasons locally common about Liskeard and Truro, and have been recorded from Tean, Isles of Scilly. *N. septembrella* has with difficulty been raised from larvae in the leaves of St. John's wort taken near Newquay, and *N. cryptella* from the leaves of bird's-foot trefoil picked near Perranporth. *N. subbimaculella* was taken by Marshall in East Cornwall. Atmore found *Opostega crepusculella* frequently in Trevaylor Valley, near Penzance. *Bucculatrix nigricomella* has with difficulty been bred from larvae on ox-eye daisies found at St. Clement, and *B. crataegi* from larvae on whitethorn from Little Canaan, Truro. *Lithocolletis sylvella* has been captured by beating maple bushes near Bodmin. *L. cramerella* is apparently widespread, but not common, except occasionally in the east of the county. *L. alnifoliella* has been bred from alder leaves taken near Launceston, and *L. nigrescentella* from leaves of *Vicia sepium* from near Liskeard. *L. ulmifoliella* and *L. spinolella* were recorded by Marshall from Botus Fleming. *L. viminetorum* and *L. salicicolella* have been bred from willow leaves gathered by the side of the Fowey, and *L. pomifoliella* from apple leaves taken at Nance, Truro. *L. terminalis* was raised from larvae in the leaves of cultivated cherries gathered at St. Gurons, Bodmin. *L. faginella* is locally common all over the county, though less frequently found in the west than the east. *L. coryli* and its larvae seem to be everywhere plentiful. Larvae of *L. quercifoliella* are widely distributed, and the moths are occasionally taken. *L. messaniella* has been bred from the leaves of *Quercus ilex* from St. Germans, and the mines of the larvae were noticed by Jenkinson at Scilly. *L. viminiella* is found over the greater part of the county, but is never very common. *L. corylifoliella* has been bred from apple leaves taken from trees at Nance, Truro, and *L. nicellii* from hazel leaves from Coomb Valley. *L. froelichii* was reported by Marshall from East Cornwall. *L. schreberella* has been bred at Newquay from elm. *L. emberizipennella* is widely spread on honeysuckle leaves in the larval stage, and the moth has been taken occasionally. *L. trifasciella* is distributed all over the county, including Scilly. *Ornix guttea* is fairly common in gardens about Bodmin and Truro. *O. betulae* has been taken near Launceston. *O. torquillella* is sometimes plentiful about St. Burian. *O. anglicella* and *O. avellanella* are widely spread and have been bred from larvae. *Coriscium sulphurellum* has been taken between Launceston and North Hill. *C. brongniardellum* has been bred from oak leaves at Millook. *Gracilaria alchimieella* is abundant in the east and locally common in the west of the county. Jenkinson has taken worn specimens of *G. stigmatella* from sallow at Scilly. *G. elongella* was recorded by Marshall from Botus Fleming. *G. tringipennella* has been bred from leaves of plantain at Truro, and was found by Jenkinson at Scilly. *G. syringella* is common in gardens at Liskeard and Bodmin. *G. auroguttella* has been reared from larvae in rolled leaves of St. John's wort from Hayle. Similar larvae have been seen at Pencalenick. *Leucoptera laburnella* is widely spread in the larval stage in the leaves of laburnum, and has been frequently bred. The moth is occasionally taken about Liskeard. *L. spartifoliella* has been taken about the Beacon at St. Agnes. *L. scitella* was bred in 1891 from larvae in the leaves of mountain-ash from near Falmouth. *Lyonetia clerkella* has been reared from pupae on apple leaves at Callington, and has been recorded from Scilly. *Phyllocnistis suffusella* has been bred from poplar leaves from Bodmin. *Bedellia somnulentella* was taken by Marshall in East Cornwall, and has been bred from leaves of convolvulus at Millook. *T. complanella* has been bred from oak leaves taken near Kilkhampton. *T. marginata* is common, at least in the larval stage. A single specimen of *Ocnerostoma piniariella* was taken at Bishop's Wood in April, 1901. *Cedestis gysselella* has been recorded from East Cornwall by Marshall. *Argyresthia dilectella* was bred from juniper from the Liskeard district in 1891. *A. brockeella* and *A. sorbiella* have been obtained by Marshall at Botus Fleming. *A. goedartella* has been taken at Scilly by Jenkinson. *A. pygmaeella* and *A. cornella* are common by the Tamar and the Lynher. The latter also occurs at Lostwithiel. *A. aurulenta* has been taken near Cargreen. *A. retinella* is reported to be common in the Upper Tamar district. *A. mendica* is nowhere common, but occurs locally from Saltash to Penzance. *A. spiniella* is locally common on hedgebanks as far west as Doublebois. *A. ephippella* has been bred from cherry shoots near Launceston. *A. nitidella* for the last four years has been the commonest county species. *A. albistria* is also very common, especially in the west. *A. semitestacella* is locally plentiful in the east of the county. *Swammerdamia combinella* occurs in gardens about Bodmin. *S. lutaria* has been taken at least once near Looe. *S. caesiella* is at times plentiful in the eastern districts, and is occasionally associated with *S. pyrella*. *Acrolepia pygmaeana* is apparently scarce, but has been bred from larvae on *Solanum dulcamara*. *Fumea intermediella* is common over the eastern half of the county and at Falmouth. One specimen of *Narycia melanella* has been reported from Heligan. *Teichobia verhuellera* is often common throughout the county about hart's-tongue fern, and in one favoured spot near Launceston was abundant in June, 1902, on a ceterach-covered bridge. *Ochsenheimeria birdella* was taken by Dale at Mousehole. *Scythropia crataegella* has been obtained by Tellam at Bodmin. *Incurvaria muscalella* is recorded by Marshall from East Cornwall. *Lampronia quadripunctella* has been bred from larvae in rose shoots found in

INSECTS

Truro gardens. Three specimens of *L. luzella* were captured by Atmore in Trevaylor Valley, near Penzance. *L. praelatella* has been taken on strawberry beds at Penryn. The grubs of *L. rubiella* caused considerable damage to the raspberry crop in some Penzance gardens in 1899, and a number of them were found near Truro in 1905. *Monopis ferruginella* is fairly common in dry outhouses and barns in the east of the county, and is reported from Scilly. *M. rusticella* occurs occasionally in barns about Truro, and was found by Marshall at Botus Fleming. *Trichophaga tapetiella* is widespread and often abundant in houses. *Tinea arcella* was taken near the Lion's Den, Millook, in August, 1905. *T. corticella* has been obtained occasionally near the railway viaduct at Truro. *T. granella* is very common in granaries and in stables, especially in the east. *T. cloacella* is widespread, but local. *T. nigripunctella* has been taken about Bodmin. *T. fuscipunctella* occurs all over the county, and is often abundant in stables, haylofts and dry outhouses. *T. pellionella* is very common in houses. *T. pallescentella* has lately been taken on grain, chaff, crushed oats, &c., at Truro and at Falmouth. *T. lapella* is common about Truro, and has been taken by Atmore at Penzance. *T. semifulvella* frequents a hedgebank on the way from Truro to Carnon Downs. Stainton says that a species allied to *T. argentimaculella* was taken by Jenkinson at Scilly. *Nemophora swammerdammella* is common about Bishop's Wood, Truro. *N. schwarziella* is at times most abundant in the east of the county, and small clouds of this species have been seen as far west as Truro. *N. metaxella* has been recorded by Thomas from St. Germans. *Adela fibulella* was common in the Restormel Valley in 1900. *A. croesella* has been taken several times in gardens at Truro. *A. degeerella* is occasionally found in several of the woods near the Tamar. *A. viridella* is common in the north-east of the county and about Liskeard, and was recorded by Marshall from Botus Fleming. *A. cuprella* has been taken twice at willow catkins near Malpas, Truro.

MICROPTERYGINA

HEPIALIDAE

The gold swift *Hepialus hectus* is very local and scarce. It has been taken at Launceston, Truro, Falmouth, Penzance and Mawgan-in-Pyder. *H. lupulinus* is in some seasons widespread and common. *H. sylvinus* has been taken sparingly from St. Austell to Penzance. *H. humuli* is often common in the east and middle of the county, but is less frequently seen in the west.

MICROPTERYGIDAE

Micropteryx sparmannella has been taken near Bodmin. *M. purpurella* is on the list from the upper Tamar district. *M. semipurpurella* has been bred from the leaves of birch gathered at Luxulian, and *M. unimaculella* from similar leaves collected in the Looe Valley. *M. subpurpurella* occurred in abundance in Coomb Valley, Kilkhampton, in May, 1902, and has been bred from oak leaves taken at Millook. *Eriocephala thunbergella* was common in Bishop's Wood, Truro, in May, 1901. *E. aruncella* occurs at St. Clement's and in the woods at Tregothnan. *E. calthella* was taken by Marshall in East Cornwall.

DIPTERA

Except for Verrall's recent volume on the Syrphidae and some of their allies the literature on the Diptera is practically inaccessible to the ordinary worker. The species, too, in many cases are so difficult to identify that records for this order are chiefly the result of expert investigation. In 1890 Mr. C. W. Dale published in the *Transactions of the Penzance Natural History and Antiquarian Society* a list of about 340 species taken by himself and his father, Mr. J. C. Dale, in West Cornwall. In vol. xl of the *Entomologists' Monthly Magazine*, Colonel Yerbury gives a list of thirty-four species from Scilly. These, with the references to Cornwall in Verrall's work already mentioned, and occasional notes in periodical literature, seem to exhaust the published records of Cornish Flies.

In the compilation of the accompanying list the writer has been particularly fortunate in his friends. Mr. C. G. Lamb of Cambridge has not only supplied him with an annotated list of the flies he has identified in the Padstow district, but he has sent a duplicate collection for the museum at Truro; Mr. A. J. Tate of Truro has been most generous in supplying local data and specimens, and as far back as 1890 the late Rev. J. Winsor Aubrey, rector of Hale, Hants, drew up a list of the named Diptera in his collection that had been taken at Looe. Valuable help was also given by the late Rev. T. A. Marshall of Botus Fleming. In the following list the letters A., D., L., M., T., V., and Y. stand for Aubrey, Dale, Lamb, Marshall, Tate, Verrall, and Yerbury respectively. A few records by Mr. F. Jenkinson from Scilly are marked J.

A HISTORY OF CORNWALL

ORTHORRHAPHA

NEMATOCERA

PULICIDAE¹

- Pulex irritans*, L. No comb-like process on chin or pronotum; general
- *fasciatus*, Bosc. Comb of about eighteen teeth on pronotum; on brown rat, *Truro*
- *avium*, Tasch. Comb of about twenty-eight teeth on pronotum; on a fowl, *Truro*; *W. Cornwall*
- *melis*, Walker. Comb of about eighteen teeth on pronotum; on a badger from *Baldhu*
- *sciurorum*, Bouché. Comb of about eighteen teeth on pronotum; on a squirrel from *Kea*
- *serriceps*, Gerv. Comb of about sixteen teeth on chin and of about twenty teeth on pronotum; on dogs and cats
- *erinacei*, Bouché. Comb of about four teeth on chin and one of six on pronotum; on a hedgehog from *Kea*
- *goniocephalus*, Tasch. Comb of five or six teeth on each side of face and one of about twelve on pronotum
- Hystrihopsylla obtusiceps*, Rits. Comb of about twenty teeth on the chin, of over forty on pronotum, with combs on sixth, seventh, and eighth segments; on a mole from *Nance, Truro*
- Typhlopsylla musculi*, Dugés. Comb of about eight teeth on chin, and of about twenty on pronotum; on house mouse, *Truro*
- *gracilis*, Tasch. Comb of three or four teeth on each side of the head, and one of about eighteen teeth on pronotum; none could be found on moles from the *Truro* district, but the species was well represented on a mole from *Menheniot*

CECIDOMYIDAE²

- Lasioptera rubi*, Schrk. Galls not uncommon locally on bramble stems throughout the county and at *Scilly*
- Cecidomyia betulae*, Winn. Characteristic galls formed from the male catkins of the birch; locally common in the east of the county and near *St. Agnes*
- *bursaria*, Bremi. The pretty little galls abundant almost everywhere on the leaves of ground ivy
- *crataegi*, Winn. Solitary galls formed from tuft of leaves at summit of upright shoots of hawthorn; common throughout the county, especially in 1902
- *destructor*, Say. In 1886 the appearance of the Hessian Fly in Great Britain caused considerable alarm among agriculturists. The summer form of attack upon the growing straw was recorded from the *Penzance* and the *Liskeard* districts, but the insect did not appear to spread, and speedily died out

¹ The list of Cornish Pulicidae was drawn up by the Truro Agricultural Students in 1901 exactly as it stands.

² With few exceptions the presence of the following Cecidomyid species in Cornwall has been established by the identification not of the insects themselves, but of the galls they produce. Only those county gall-makers are recorded that are described and figured in Connold's *British Vegetable Galls*, as the published accounts of the other species were inaccessible to the writer.

ORTHORRHAPHA (continued)

NEMATOCERA (continued)

CECIDOMYIDAE (continued)

- Cecidomyia lathyri*, Frfid. Apical galls on *Lathyrus pratensis* found at *Scawswater*, September, 1901, and at *Bodmin*, July, 1903
- *marginemtorquens*, Bremi. Galls formed by reflexed margins of leaves of common willow not uncommon near *Truro*
- *rosarum*, Hardy. Pod-like galls formed from simple folded leaflets of the dog-rose, very common in 1901, but scarce during the last two years
- *saliciperda*, Duff. Roundish and irregular galls often common near the apex of the willow twigs throughout the year
- *ulmariae*, Bremi. The tiny gregarious globular galls abundant on leaves of meadow-sweet at *Pencalenick*, June, 1904
- *urticae*, Perris. Galls on almost every part of the common nettle, abundant at *Millook* in 1905, and occasionally found in quantity on nettle patches throughout the county
- *veronicae*, Vallot. The terminal green leaf-formed galls covered with long white hairs extraordinarily abundant almost everywhere on *Germander speedwell*
- *violae*, F. Lw. Galls formed from unrolled base of leaf lamina on dog violet, common in occasional clumps
- Diplosis botularia*, Winn. Long slender galls on mid-rib of the leaflets of the ash, widespread and locally common
- *pyrivora*, Riley. This is the deadliest enemy to pear cultivation in Cornwall, though it does not seem to have been noticed in the county till thirteen years ago
- *tremulae*, Winn. Galls on the petioles of aspen widely spread but local
- *tritici*, Kirby. The wheat midge. This seems to have been a much more serious pest in the county twenty or thirty years ago than it is at present. No attack on an extensive scale has been recorded since systematic observations were undertaken seven years ago, but wheat heads are occasionally sent in from the east and middle of the county containing numerous lemon or orange coloured cecidomyid larvae sometimes just inside the outer glumes, at other times on the young ovary. It is presumed these belong to this species, but the insect itself has not been submitted to a competent authority for identification
- Hormomyia annulipes*, Hart. Pilose yellowish-orange gregarious galls abundant on the upper surface of the leaves of a beech tree at *Bodmin* in July, 1901
- *caprae*, Winn. Coalesced greenish-yellow galls not uncommon on the under-surface of the leaf of the willow
- *fagi*, Hartig. Small gregarious glabrous galls of a yellowish colour, bright red at the apex, on the upper surface of the leaf of the beech, found somewhat sparingly at *Launceston*
- *millefolii*, Lw. Small irregular pedunculated green galls on the leaf segments and midrib of yarrow, widely spread, but not usually plentiful

INSECTS

ORTHORRHAPHA (continued)

NEMATOCERA (continued)

MYCETOPHILIDAE

- Sciara thomae*, L. Looe (A.)
Mycetophila punctata, Mg. } *W. Cornwall* (D.)
 — *lineola*, Mg. }
 — *bimaculata*, F. }
Docosia sciarina, Mg. *W. Cornwall* (D.)
Sceptonia nigra, Mg. *Scilly*, March, 1902 (J.)
Macrocera lutea, Mg. } *W. Cornwall* (D.)
 — *centralis*, Mg. }
Bolitophila fusca, Mg. Looe (A.); *W. Cornwall* (D.)

BIBIONIDAE

- Scatopse notata*, L. } *W. Cornwall* (D.)
 — *flavicollis*, Mg. }
Dilophus febrilis, L. *Liskeard*; *Truro*; *Mawgan*; *W. Cornwall* (D.)
Bibio pomonae, F. *W. Cornwall* (D.)
 — *Marci*, L. *E. Cornwall* (M.); *Truro*; *Falmouth*; *W. Cornwall* (D.)
 — *venosus*, Mg. *E. Cornwall*; *Bodmin*; *Penzance* (Baily)
 — *laniger*, Mg. Common, *Truro*; *Scilly* (Y.)
 — *Johannis*, L. *Truro*; *W. Cornwall* (D.); *Tresco*, *Scilly* (Y.)
 — *clavipes*, Mg. *W. Cornwall* (D.)

SIMULIDAE

- Simulium reptans*, L. }
 — *maculatum*, Mg. } *W. Cornwall* (D.)
 — *latipes*, Mg. }

CHIRONOMIDAE

- Chironomus annularis*, Deg. Looe (A.); *W. Cornwall* (D.)
 — *pallens*, Mg. *W. Cornwall* (D.); *Land's End* (Baily)
 — *dorsalis*, Mg. Marsh beyond *Bishop's Wood*, *Truro*, 16 September, 1905
 — *pedellus*, Deg. *W. Cornwall* (D.); *Land's End* (Baily)
 — *viridis*, Mcq. Near the railway viaduct, *Truro*; *Swanpool*, *Falmouth*, 30 August, 1900
 — *nigrimanus*, Stöck. *Swanpool*, 30 August, 1900
 — *virescens*, Mg. *W. Cornwall* (D.); *Marazion* (Baily)
 — *histrio*, F. *W. Cornwall* (D.); *Land's End*
Cricotopus pilitarsis, Ztt. *Swanpool*, 30 August, 1900
 — *bicinctus*, Mg. *W. Cornwall* (D.)
 — *sylvestris*, F. *Swanpool*, 30 August, 1900; *Marazion* and *Land's End*
Orthocladius stercorarius, Deg. } *W. Cornwall* (D.)
 — *minutus*, Ztt. }
Camptocladius aterrimus, Mg. } *W. Cornwall* (D.)
Tanytarsus vernus, Mg. }
Tanytus varius, F. *Marazion*, 20 September, 1902
 — *phatta*, Egg. *Swanpool*, 30 August, 1900
 — *melanops*, Mg. *Swanpool*, 30 August, 1900; *Land's End*
Ceratopogon bipunctatus, L. } *W. Cornwall* (D.)
 — *pulicaris*, L. }

ORTHORRHAPHA (continued)

NEMATOCERA (continued)

ORPHNEPHILIDAE

- Orphnephila testacea*, Ruthé. Fairly abundant in restricted localities in *Harlyn Bay* where springs run over the rocks (L.); *W. Cornwall* (D.)

PSYCHODIDAE

- Pericoma trivialis*, Eat. Looe (A.); *Penzance* district (D.)
 — *canescens*, Mg. } *W. Cornwall* (D.)
 — *ocellaris*, Mg. }
 — *ambigua*, Eat. Looe (A.)
Psychoda phalaenoides, L. } *W. Cornwall* (D.)
 — *humeralis*, Mg. }
Trichomyia urbica, Hal. *Penzance* district (D.)

CULICIDAE

- Anopheles bifurcatus*, L. } *W. Cornwall* (D.)
Culex annulatus, Schrk. }
 — *pipiens*, L. Looe (A.); *W. Cornwall* (D.)

DIXIDAE

- Dixa maculata*, Mg. *Falmouth*; *W. Cornwall* (D.)
 — *nebulosa*, Mg. *Marazion*, 20 September, 1902
 — *aestivalis*, Mg. *Pencalenick*, 18 August, 1901; *W. Cornwall* (D.)
 — *aprilina*, Mg. *Marazion*, 20 September, 1902

PTYCHOPTERIDAE

- Ptychoptera contaminata*, L. Looe (A.); *W. Cornwall* (D.)
 — *paludosa*, Mg. *Penzance*; *St. Martin's*, *Scilly* (Y.)
 — *albimana*, F. *W. Cornwall* (D.)

LIMNOBIDAE

- Limnobia nubeculosa*, Mg. *E. Cornwall* (M.); Looe (A.)
 — *flavipes*, F. } *W. Cornwall* (D.)
 — *analis*, Mg. }
 — *stigma*, Mg. Looe (A.); *W. Cornwall* (D.)
 — *macrostigma*, Schum. *W. Cornwall* (D.)
Dicranomyia pilipennis, Egg. Looe (A.)
 — *modesta*, Mg. } *W. Cornwall* (D.)
 — *chorea*, Mg. }
 — *didyma*, Mg. *Middle Lynher*, 1 June, 1900 (Thomas)
 — *dumetorum*, Mg. *Truro*; *W. Cornwall* (D.)
 — *goritiensis*, Mik. *W. Cornwall* (D.)
Rhipidia maculata, Mg. Looe and *Liskeard* (A.)
Geranomyia unicolor, Hal. *Whitsand Bay*, 5 October, 1894 (Y.); *W. Cornwall* (D.)
Rhamphidia longirostris, Mg. *Penzance* district (Baily)
Empeda nubila, Schum. *E. Cornwall* (M.)
Acyphona maculata, Mg. Looe (A.)
Molophilus ochraceus, Mg. *W. Cornwall* (D.)
 — *bifilatus*, Verr. *Mount Edgumbe* (Thomas)
 — *obscurus*, Mg. *W. Cornwall* (D.)
 — *murinus*, Mg. *W. Cornwall* (D.)
Rhypholophus lineatus, Mg. } *W. Cornwall* (D.)
 — *nodulosus*, Mcq. }
 — *haemorrhoidalis*, Ztt. Fairly common at *Mount Edgumbe*, 23 September, 1902 (Thomas)

A HISTORY OF CORNWALL

ORTHORRHAPHA (continued)

NEMATOCERA (continued)

LIMNOBIDAE (continued)

- Erioptera taenionota, Mg. *W. Cornwall* (D.); *Scilly* (Walker)
 — fuscipennis, Mg. } *W. Cornwall* (D.)
 — trivialis, Mg. }
 Symplecta stictica, Mg. *Looe* (A.); *W. Cornwall* (D.); *Land's End* (Baily)
 Ephelia apicata, Lw. *Mount Edgcumbe*, 18 July, 1904; *W. Cornwall* (D.); *Land's End*
 — marmorata, Mg. *W. Cornwall* (D.)
 Poecilostola punctata, Schrk. *Looe* (A.)
 Limnophila Meigenii, Verr. *St. Martin's, Scilly* (Y.)
 — dispar, Mg. *Middle Lynher*, 1 June, 1900 (Thomas)
 — lineola, Mg. *St. Germans*, 10 April; *Middle Lynher*, 1 June, 1900 (Thomas)
 — lineolella, Verr. *Penzance* (Baily)
 — aperta, Verr. *Middle Lynher*, 1 June, 1900 (Thomas); *W. Cornwall* (D.)
 — ferruginea, Mg. *W. Cornwall* (D.)
 — ochracea, Mg. *Trebartha*; *W. Cornwall* (D.)
 — discicollis, Mg. *Middle Lynher*, 2 June, 1900 (Thomas); *W. Cornwall* (D.)
 — lucorum, Mg. *Mount Edgcumbe*, 18 July, 1904
 — nemoralis, Mg. *W. Cornwall* (D.)
 — filata, Wlk. *Middle Lynher* (Thomas)
 Trichocera annulata, Mg. }
 — hiemalis, Deg. } *W. Cornwall* (D.)
 — fuscata, Mg. }
 Ula pilosa, Schum. *Looe* (A.); *W. Cornwall* (D.)
 Dicranota pavidula, Hal. *Penzance* (Baily)
 Amalopsis immaculata, Mg. *Mount Edgcumbe*; *Looe* (A.); *W. Cornwall* (D.)
 — claripennis, Verr. *W. Cornwall* (D.)
 — occulta, Mg. *Middle Lynher*, 1 June, 1900 (Thomas)
 — littoralis, Mg. *Truro*, 10 October, 1905
 Pedicia rivosula, L. *W. Cornwall* (D.)
 Cylindrotoma distinctissima, Mg. *Penzance*
 Phalacrochera replicata, L. *Looe* (A.)

TIPULIDAE

- Dolichopeza sylvicola, Curt. *Falmouth*
 Pachyrrhina crocata, L. *Middle Lynher*; *Truro*
 — histrio, F. *Trebartha*; *Looe* (A); *Truro*
 — maculosa, Mg. Not uncommon at *Millook* in August 1905; has been taken at *Liskeard*, May 1902; was very common at *Bodmin* in 1903 and is occasionally brought in by the students at *Truro*; has been taken at *Newquay*; is probably generally distributed
 Tipula pagana, Mg. *Falmouth*; *W. Cornwall* (D.)
 — confusa, v. d. Wulp. *Malpas* and *Scawswater, Truro*; *W. Cornwall* (D.)
 — longicornis, Schum. *Kea*, near *Truro*; *Newquay*
 — varipennis, Mg. *Budock Bottoms, Falmouth*
 — scripta, Mg. *Pencalenick, Truro*; *Kea*; *Budock*; *W. Cornwall*
 — luteipennis, Mg. *Pencalenick* and *Ruan-Lanihorne, Truro*; *Falmouth*; *W. Cornwall*
 — lunata, L. *Kea*; *Devoran*; *W. Cornwall*
 — vittata, Mg. *Penzance* and *Land's End*
 — gigantea, Schrk. *Pencalenick*; *W. Cornwall* (D.)
 — lutescens, F. *E. Cornwall* (M.); *Bodmin*

ORTHORRHAPHA (continued)

NEMATOCERA (continued)

TABANIDAE (continued)

- Tipula oleracea, L. Common throughout the county and at *Scilly*. The frequent wet autumns in Cornwall make this pest at times unfortunately abundant, and although the damage done to crops is almost invariably attributed to the wireworm, there is no doubt that in some years, like 1904, these 'leather jackets' cause a large amount of damage. In the winter of 1903-4, some autumn-sown wheat near *Falmouth* was completely destroyed by this pest and the spring-sown oats in the same field were ruined.
 It seems probable that Pachyrrhina maculosa is at times so common locally as to be a source of considerable loss to the farmers, especially among young seeds
 T. paludosa, Mg. Fairly common in 1904 about *Bodmin*; of frequent occurrence around *Truro* and *Falmouth*; *W. Cornwall*; probably fairly general in its distribution
 T. ochracea, Mg. *Newquay*; *Truro*; *Swanpool*; *Land's End*; *W. Cornwall* (D.)

RHYPHIDAE

- Rhyphus fenestralis, Scop. *Padstow* (L.); *W. Cornwall* (D.)
 — punctatus, F. *W. Cornwall* (D.)

BRACHYCERA

STRATIOMYIDAE

- Pachygaster Leachii, Curt. Very abundant in a ditch near *Trescore, Portbeathan* (L.); *W. Cornwall* (D.)
 Nemotelus pantherinus, L. *Padstow* (L.)
 — nigrinus, Flin. *Padstow* (L.)
 Oxyera Morrisii, Curt. Two specimens on a tree outside *Trescore* (L.)
 — pulchella, Mg. *Padstow* (L.)
 — trilineata, F. *Padstow* (L.)
 Stratiomys chamaeleon, L. *W. Cornwall* (D.)
 Odontomyia viridula, F. *Padstow* (L.); *W. Cornwall* (D.)
 Sargus cuprarius, L. *W. Cornwall* (D.)
 Chloromyia formosa, Scop. *Padstow* (L.)
 Microchrysa polita, L. *Padstow* (L.); *W. Cornwall* (D.)
 — flavicornis, Mg. *Padstow* (L.)
 Beris vallata, Först. *Padstow* (L.)
 Chorisops tibialis, Mg. *Padstow* (L.); *W. Cornwall* (D.)

TABANIDAE

The Tabanidae are popularly known as Breeze Flies, Horse Flies, Gad Flies and Clegs. Though the males appear to frequent flowers and live on their nectar the females are all bloodsuckers and cause considerable annoyance to stock and more especially to horses. The larvae are not parasitic, but live in the ground, and in some species in water, and appear to be carnivorous.

INSECTS

ORTHORRHAPHA (continued)

BRACHYCERA (continued)

TABANIDAE (continued)

- Haematopota pluvialis*, L. The Rain Cleg. Evidently generally distributed throughout the county and often uncomfortably abundant; specially troublesome on farm stock in and after stormy weather during the summer and on very hot days
- H. crassicornis*, Whlbg. *Botus Fleming* (M.); common on the *Middle Lynher*, 1 June, 1900
- Theriopectes solstitialis*, Mg. Near *Trebartha*; above *Altarnun*
- Atylotus fulvus*, Mg. Two females captured near *Marazion Marsh*, 12 June, 1904
- Tabanus bovinus*, (L.) The Gnat Gadfly. Common above the *Cascade Wood at Trebartha* in July 1902; plentiful near *Draynes Wood, Liskeard*, in 1904; not uncommon *Bishop's Wood, Truro* (T.); *Pencalenick*; *Budock Bottoms*.
- T. sudeticus*, Zlr. *Altarnun*; sparingly taken near *Bodmin*, 14 June, 1904
- *autumnalis*, L. *E. Cornwall* (M.); *Millook*; *Looe* (A.); *Swanpool*, 18 September, 1903
- *bromius*, L. *E. Cornwall* (M.); *Millook*; *Lostwithiel*; *W. Cornwall* (D.)
- *maculicornis*, Ztt. *Middle Lynher*, 1 June, 1900
- *cordiger*, W. Near *Calstock*; *Looe* (A.); *Lostwithiel*
- *glaucoptis*, Mg. Two females taken on the banks of the *Inney* near *Altarnun*, 10 July, 1901
- Chrysops caecutiens*, L. Widely spread throughout the east of the county in 1901, and annoyingly abundant about *Altarnun*; common locally at *Millook* in 1905; *Liskeard*; plentiful at *Bishop's Wood, Truro* (T.), at *Pencalenick* and *Ruan-Lanihorne*; *Newquay*; *W. Cornwall* (D.)
- *quadrata*, Mg. *Altarnun*, 10 July, 1901; *Trebartha*, August 1902
- *relicta*, Mg. Near *Calstock*, 4 June, 1904

LEPTIDAE

- Leptis scolopacea*, L. *Penwithers, Truro* (T.); *W. Cornwall* (D.)
- *tringaria*, L. *W. Cornwall* (D.)
- *lineola*, F. *Trebartha*; *Liskeard*
- Chrysopilus aureus*, Mg. *Padstow* (L.); *W. Cornwall* (D.)
- *auratus*, F. *Padstow* (L.); *W. Cornwall* (D.)
- Atherix marginata*, F. *Middle Lynher*; *Looe* (A.)
- *ibis*, F. *Looe* (A.); *Falmouth*
- Ptiolina Wodzikii*, Frfld. One specimen on *Porthcothan Bay*, blown down there by high wind; true place of origin not found (L.)
- Xylophagus ater*, F. *Liskeard*; *Doublebois*

ASILIDAE

- Leptogaster cylindrica*, Deg. *Padstow* (L.); *W. Cornwall* (D.)
- Dioctria Baumhaueri*, Mg. Above *Trebartha*; *Altarnun*
- *flavipes*, Mg. *W. Cornwall* (D.)
- Isopogon brevisrostris*, Mg. Above *Trebartha*; *Liskeard*
- Asilus crabroniformis*, L. *Padstow* (L.); five or six just beyond the *Grammar School, Truro* (T.); *W. Cornwall* (D.)

ORTHORRHAPHA (continued)

BRACHYCERA (continued)

ASILIDAE (continued)

- Philonicus albiceps*, Mg. *St. Ives* (L.)
- Epitriptus cingulatus*, F. *Padstow* (L.)
- Neoitamus cyanurus*, Lw. *E. Cornwall* (M.); *Mount Edgcombe*
- Machimus atricapillus*, Flin. *Padstow* (L.)
- Eutolmus rufibarbis*, Mg. *W. Cornwall* (D.)
- Dysmachus trigonus*, Mg. *Padstow* (L.); *W. Cornwall* (D.)

BOMBYLIDAE

- Anthrax paniscus*, Rossi. *Padstow* (L.); *Camborne*; *St. Ives*; *Land's End*
- Bombylius canescens*, Mik. *Padstow* (L.)
- Phthiria pulicaria*, Mik. *Padstow* (L.)

THEREVIDAE

- Thereva nobilitata*, F. *Padstow* (L.); *W. Cornwall* (D.)
- *funebri*, Mg. *Padstow* (L.)
- *annulata*, F. *Padstow* (L.)

SCENOPINIDAE.

- Scenopinus niger*, Deg. *W. Cornwall* (D.)

EMPIDAE

- Hybos grossipes*, L. } *W. Cornwall* (D.)
- *femoratus*, Müll. }
- Rhamphomyia nigripes*, F. } *W. Cornwall* (D.)
- *cinerascens*, Mg. }
- *spinipes*, Flin. }
- *tarsata*, Mg. *Newquay*
- *flava*, Flin. *W. Cornwall* (D.)
- Empis tessellata*, F. *E. Cornwall* (M.); *Looe* (A.); *W. Cornwall* (D.)
- *livida*, L. }
- *stercorea*, L. }
- *trigramma*, Mg. } *W. Cornwall* (D.)
- *punctata*, Mg. }
- *lutea*, Mg. }
- *pennipes*, L. *Looe* (A.); *W. Cornwall* (D.)
- *pennaria*, Flin. *W. Cornwall* (D.)
- Pachymyia femorata*, F. *E. Cornwall* (M.); *W. Cornwall* (D.)
- Hilara cilipes*, Mg. }
- *maura*, F. }
- *obscura*, Mg. }
- *thoracica*, Mcq. }
- Microphorus velutinus*, Mcq. } *W. Cornwall* (D.)
- Oedalea flavipes*, Ztt. }
- Ocydromia glabricula*, Flin. }
- Clinocera bipunctata*, Hal. *Middle Lynher*; *W. Cornwall* (D.)
- Heleodromia stagnalis*, Hal. *W. Cornwall* (D.)
- *fontinalis*, Hal. *W. Cornwall* (D.); *St. Martin's Scilly* (Y.)
- Wiedemannia bistigma*, Curt. }
- Hemerodromia precatatoria*, Flin. }
- *melanocephala*, Hal. }
- *unilineata*, Ztt. } *W. Cornwall* (D.)
- Ardoptera irrorata*, Flin. }
- *guttata*, Hal. }
- Lepidomyia melanocephala*, F. }

A HISTORY OF CORNWALL

ORTHORRHAPHA (continued)

BRACHYCERA (continued)

EMPIDAE (continued)

- Drapetis assimilis*, Fln. }
Tachista arrogans, L. }
Elaphropeza ephippiata, Fln. } *W. Cornwall* (D.)
Tachydromia minuta, Mg. }
— *maculipes*, Mg. }
— *flavipes*, F. }
— *fasciata*, Mg. }
— *varia*, Wlk. }

DOLICHOPODIDAE

- Psilopus platypterus*, F. *Padstow* (L.); *W. Cornwall* (D.)
— *longulus*, Fln. } *Padstow* district (L.)
— *contristans*, W. }
Eutarsus aulicus, Mg. } *Padstow* district (L.)
Dolichopus atripes, Mg. }
— *plumipes*, Scop. *Padstow* (L.); *W. Cornwall* (D.)
— *pennatus*, Mg. } *Padstow* district (L.)
— *griseipennis*, Stan. }
— *signifer*, Hal. Two specimens taken by Lamb in the *Padstow* district, but exact locality unknown. These are the only specimens captured since Haliday described the species from the west coast of Ireland
— *simplex*, Mg. *Padstow* (L.)
— *festivus*, Hal. *Padstow* (L.); *W. Cornwall* (D.)
— *brevipennis*, Mg. *W. Cornwall* (D.)
— *ungulatus*, L. *Padstow* (L.); *W. Cornwall* (D.)
Tachytrechus notatus, Stan. Abundant on the sand at the mouth of the little stream in *Constantine Bay*, *Padstow* (Lamb)
— *insignis*, Stan. *Padstow* (L.)
Poecilobothrus nobilitatus, L. *E. Cornwall* (M.); *Liskeard*; *Padstow* (L.); *W. Cornwall* (D.)
Hercostomus gracilis, Stan. }
— *chaerophyllii*, Mg. } *Padstow* district (Lamb)
— *nigripennis*, Fln. }
— *parvilamellatus*, Mcq. }
Hypophyllus obscurellus, Fln. }
Orthochile nigrocoerulea, Ltr. Taken on the towans at *Harlyn* and also a few at *Crackrattle* (L.)
Chrysotus laesus, W. } *Padstow* (L.)
— *gramineus*, Fln. }
Diaphorus oculatus, Fln. *W. Cornwall* (D.)
Argyra diaphana, F. *E. Cornwall* (M.); *Looe* (A.); *W. Cornwall* (D.)
— *argyria*, Mg. *Padstow* (L.)
— *leucocephala*, Mg. *Padstow* (L.); *Mevagissey*
Porphyrus nemorum, Mg. } *Padstow* district (L.)
Syntormon pumilus, Mg. }
— *pallipes*, F. }
Xiphandrium caliginosum, Mg. *Padstow* (L.)
— *appendiculatum*, Ztt. *W. Cornwall* (D.)
— *brevicorne*, Curt. *Padstow* (L.)
Medeterus micaceus, Lw. }
— *muralis*, Mg. } *Padstow* district (L.)
— *flavipes*, Mg. }
— *truncorum*, Mg. }
— *dendrobaenus*, Kow. }
— *petrophilus*, Kow. }
Scellus notatus, F. *Padstow* (L.); *W. Cornwall* (D.)
Hydrophorus nebulosus, Fln. *W. Cornwall* (D.)
— *balticus*, Mg. } *Padstow* (L.)
— *praecox*, Lehm. }

ORTHORRHAPHA (continued)

BRACHYCERA (continued)

DOLICHOPODIDAE (continued)

- Liancalus virens*, Scop. *Whitsand Bay east*; *Looe* (A.); *Padstow* (L.); *W. Cornwall* (D.)
Campsicnemus scambus, Fln. *Scilly* (J.)
— *curvipes*, Fln. *W. Cornwall* (D.)
Sympycnus annulipes, Mg. *Looe*; *Padstow* (L.)
— *aeneicoxa*, Mg. } *Padstow* (L.)
Xanthochlorus ornatus, Hal. }
Bathycranium bicolorellus, Ztt. A solitary specimen taken by Lamb near *Porthcothan*
Aphrosylus celtiber, Hal. *Padstow* (L.)
— *ferox*, Hal. By sweeping seaweed at *Looe*; *Padstow* (L.)

LONCHOPTERIDAE

- Lonchoptera lutea*, Pz. }
— *punctum*, Mg. } *W. Cornwall* (D.)
— *tristis*, Mg. }

CYCLORRHAPHA

PROBOSCIDEA

PLATYPEZIDAE

- Opetia nigra*, Mg. *E. Cornwall* (M.)
Callimya amoena, Mg. *E. Cornwall* (M.)
Platyeza modesta, Ztt. *E. Cornwall* (M.); *Bodmin*

PIPUNCULIDAE

- Verrallia pilosa*, Ztt. *Looe* (A.)
Pipunculus furcatus, Egg. *Looe* (A.); *E. Cornwall* (M.)
— *modestus*, Hal. There is still some doubt as to whether some specimens from *Mount Edgumbe* and *Looe* belong to this species or to *P. zonatus*
— *campestris*, Ltr. *Looe* (A.); *Penzance* (V.)
— *geniculatus*, Mg. *Bodmin*, 12 September, 1900; *W. Cornwall* (D.)
— *littoralis*, Beck. *Hayle* towans in 1902
— *sylvaticus*, Mg. *W. Cornwall* (D.)

SYRPHIDAE

- Paragus tibialis*, Fln. *E. Cornwall* (M.); *Truro*; *Penzance* (V.); *W. Cornwall* (D.)
— *virens*, F. *Padstow* (L.); *Bodmin* (Tellam); *Penzance* (V.); *W. Cornwall* (D.)
— *flavitaris*, Mg. *Budock Bottoms*, *Falmouth*, 4 and 20 June, 1902
Pipiza noctiluca, L. *Truro*; *Land's End* (V.)
— *lugubris*, F. *Looe*, 1890 (A.)
Orthoneura nobilis, Fln. *Cornwall* (V.)
Liogaster metallina, F. *E. Cornwall* (M.); *Looe* (A.); *Padstow* (L.); *Newquay*; *Truro*; *Penzance* (V.); *W. Cornwall* (D.)
Chrysogaster splendens, Mg. *E. Cornwall* (M.); *Millbrook*; *Padstow* (L.); *Penzance* (V.)
— *hirtella*, Lw. *Looe* (A.); *Bodmin* (Tellam); *Padstow* (L.)
— *virescens*, Lw. *Padstow* (L.)
— *chalybeata*, Mg. *Cornwall* (V.); *Looe* (A.); *W. Cornwall* (D.)
— *solstitialis*, Fln. *Salisbury*, 7 June, 1902; *Padstow* (L.); *Penzance* (V.)

INSECTS

CYCLORRHAPHA (continued)

PROBOSCIDEA (continued)

SYRPHIDAE (continued)

- Chilosia sparsa*, Lw. *E. Cornwall* (M.); *St. Ives* (V.)
 — *antiqua*, Mg. *E. Cornwall* (M.); *St. Ives* (V.)
 — *scutellata*, Fln. *W. Cornwall* (D.)
 — *soror*, Ztt. *Looe* (A.)
 — *pulchripes*, Lw. *Penzance* (V.)
 — *variabilis*, Pz. *E. Cornwall* (M.); *Penzance* (V.); *W. Cornwall* (D.)
 — *intonsa*, Lw. *Padstow* (L.)
 — *illustrata*, Harr. *Penzance* (V.); *W. Cornwall* (D.)
 — *grossa*, Fln. One in the Grammar School garden, *Truro* (T.)
 — *albipila*, Mg. *Looe* (A.)
 — *impressa*, Lw. *Penzance* (V.)
 — *albitarsis*, Mg. *Penzance* (V.); *W. Cornwall* (D.)
 — *fraterna*, Mg. *E. Cornwall* (M.)
 — *vernalis*, Fln. *Callington*; *Liskeard*; *Newquay*
 — *proxima*, Ztt. *Cornwall* (V.)
Platychirus manicatus, Mg. *Padstow* (L.); *Penzance*, common (V); *W. Cornwall* (D.)
 — *discimanus*, Lw. *Liskeard*
 — *peltatus*, Mg. *Lower Lynher*
 — *albimanus*, F. *Padstow* (L.)
 — *scutatus*, Mg. *Padstow* (L.)
 — *clypeatus*, Mg. *Liskeard*; *Newquay*; *Truro*; *Land's End* (V.); *W. Cornwall* (D.)
Pyrophæna granditarsa, Först. *Padstow* (L.); *W. Cornwall* (D.)
 — *rosarum*, F. *Kea*, *Truro*; *Marazion*; *W. Cornwall* (D.)
Melanostoma mellinum, L. *Liskeard*; *Bodmin*; *Padstow* (L.); *Bishop's Wood*, *Truro*
 — *scalare*, F. *Padstow* (L.); *Bishop's Wood* and *Kenwyn Hill*, *Truro*
Xanthandrus comtus, Harr. *Padstow* (L.); one specimen in Grammar School garden, *Truro*, September, 1903 (T.); *Scilly* (J.)
Leucozona lucorum, L. Common from May onwards at *Bishop's Wood* and elsewhere round *Truro* (T.)
Ischyrosyrphus glaucius, L. *Penzance* (V.)
 — *laternarius*, Müll. *Liskeard*; *Bishop's Wood*, *Truro*
Didea fasciata, Mcq. Tate has several specimens of *Didea* taken at scabious on *Kenwyn Hill*, *Truro*, which appear to belong to this species, but there is still some uncertainty as the differences between it and *P. intermedia* appear to be very trivial
Catabomba pyrastris, L. *Launceston*; *Liskeard*; *Bodmin*; *Padstow* (L.); fairly common about *Truro* (T.)
Syrphus albostrigatus, Fln. *Launceston*; appears to be common about *Truro* (T.); *W. Cornwall* (D.)
 — *tricinctus*, Fln. Tate has taken five or six at scabious on *Kenwyn Hill*, *Truro*
 — *venustus*, Mg. *Launceston*; *Liskeard*; *Garnanton Woods*, *St. Columb*; *Helston* (V.)
 — *lunulatus*, Mg. *W. Cornwall* (D.)
 — *torvus*, O. S. *Padstow* (L.); *Scilly* (J.)
 — *grossulariae*, Mg. A stray specimen or so at *Penzance* (V.)

CYCLORRHAPHA (continued)

PROBOSCIDEA (continued)

SYRPHIDAE (continued)

- Syrphus ribesii*, L. *Millook* and *Launceston*; *Trebartha*; *Liskeard* and *Looe*; *Bodmin*; *Padstow* (L.); *Newquay*; *Truro* and *Falmouth*; *St. Ives*; *Hayle* and *Penzance*; *Scilly*
 — *vitripennis*, Mg. *Millook* and *Launceston*; *Bosccastle*; *Padstow* (L.); *Truro*, *Mylor*, *Flushing*, *Penryn*; *Gulval*, *St. Burian*
 — *latifasciatus*, Mcq. *Padstow* (L.); *Newquay*; *Truro* (T); *Malpas*; *Flushing*
 — *corollae*, F. *Launceston*; *Millook*; *Liskeard*; *Padstow* (L.); *Truro*
 — *luniger*, Mg. *Liskeard*; *Malpas*; *Truro*; *Scilly* (J.)
 — *bifasciatus*, F. Common in gardens about *Truro* (T.); *W. Cornwall* (D.)
 — *balteatus*, Deg. *E. Cornwall* (M.); *Launceston*; *Liskeard*; *Bodmin*; *Padstow* (L.); *Truro* (T.); *Malpas*, *Penryn*, *Falmouth*; *Mawnan*; *Penzance* (V.); *W. Cornwall* (D.); *Scilly*
 — *cinctellus*, Ztt. *E. Cornwall* (M.); *Liskeard*
 — *cinctus*, Fln. *Botus-Fleming* (M.)
 — *auricollis*, Mg. *Launceston*; *Liskeard*; *Bodmin*; *Penzance* (V.); *Scilly* (J.)
 — *umbellatarum*, F. *W. Cornwall* (D.)
 — *compositarum*, Verr. *Penzance*, rare (V.)
 — *lasiophthalmus*, Ztt. Not uncommon at sallow in early spring in the *Truro* district
Sphaerophoria scripta, L. *Millook*, not uncommon on grass, July, 1905; *Padstow* (L.); common around *Truro* (T.); *W. Cornwall* (D.)
 — *menthastri*, L. *Liskeard*; *Land's End* (V.); *W. Cornwall* (D.)
 var. *taeniata*, Mg. Is recorded by Dale from *W. Cornwall*
 — *flavicauda*, Ztt. From asparagus beds at *St. Columb* (Black)
Xanthogramma ornatum, Mg. Occasionally found low down on the hedges about *Millook* and *Liskeard*; *Padstow* (L.); not very common about *Truro*
Baccha obscuripennis, Mg. Scarce about *Millook* and *Launceston*; *E. Cornwall* (M.); *Looe* (A.); evidently rare about *Truro*
 — *elongata*, F. *Millook*; *Padstow* (L.)
Sphegina clunipes, Fln. A single specimen taken at *Cowrie Haven*, *Poundstock*, 16 September, 1905
Ascia podagrica, F. Abundant in a border of herbaceous perennials in the garden at *St. Guron's*, *Bodmin*, 10 April, 1902, and 25 April, 1904; *Padstow* (L.); common about *Truro* (T.); plentiful in the garden at *Penwerris Grammar School*, *Falmouth*, 20 May, 1901
 — *dispar*, Mg. *W. Cornwall* (D.)
Brachyopa bicolor, Fln. Common on tree trunks in sunshine in the *Cascade Wood*, *Trebartha* in May, 1902
Rhingia campestris, Mg. Evidently common all over the county
Volucella bombylans, L. The type is not uncommon at *Liskeard*, *Bodmin*, *Truro*, *Falmouth* and *W. Cornwall* (D.) The var. *haemorrhoidalis* occurs sparingly about *Bishop's Wood*, *Truro* (T.). The var. *plumata* is fairly common there, at *King Harry Ferry* and at *Bodmin*

A HISTORY OF CORNWALL

CYCLORRHAPHA (continued)

PROBOSCIDEA (continued)

SYRPHIDAE (continued)

- Volucella inanis*, L. Two were found in *Bishop's Wood, Truro*, by Tate, 26 July 1902, but none have been found since that date in spite of careful searching
- *inflata*, F. *Cornwall* (V.); *Mount Edgumbe* (A)
 - *pellucens*, L. Common about *Millook, Launceston, Liskeard, Looe, Truro; College Wood, Penryn; Penzance* (V.)
 - Eristalis sepulchralis*, L. *W. Cornwall* (D.)
 - *aeneus*, Scop. *Padstow* (L.); one specimen on *mesembryanthemums at Tresco, Scilly* (Y.)
 - *cryptarum*, F. *Looe* (A.)
 - *tenax*, L. Evidently generally distributed throughout the county and at *Scilly*
 - *intricarius*, L. *Liskeard; Looe; Padstow; Truro; Newquay; Penzance; Scilly* (Y.)
 - *arbutorum*, L. *E. Cornwall* (M.); *Liskeard; Bodmin; Padstow* (L.); *Truro* (T.); *Penzance; Scilly* (J.)
 - *nemorum*, L. *Launceston; Padstow* (L.); *Falmouth; St. Martin's, Scilly* (Y.)
 - *pertinax*, Scop. *Botus-Fleming; Saltash; Doublebois; Padstow* (L.); *Truro* (T.)
 - *horticola*, Deg. *Millook; Launceston; Trebartha; Liskeard; Padstow* (L.); *Truro* (T.); *Falmouth; Penzance* (V.)
 - Myiatripa florea*, L. *Launceston; E. Cornwall* (M.); *Doublebois*; common about *Truro* (T.) and *Falmouth; Penzance* (V.); *W. Cornwall* (D.)
 - Helophilus trivittatus*, F. *Padstow* (L.); *Truro* (T.). Though generally regarded as a coast species Tate found his two *Truro* specimens in a marsh beyond *Bishop's Wood*
 - *hybridus*, Lw. Tate found two typical examples of this beautiful fly at ragwort by the marsh beyond *Bishop's Wood, Truro*
 - *pendulus*, L. *Padstow* (L.); *Truro* (T.)
 - *versicolor*, F. *Cornwall* (V.); *Budock Bottoms, Falmouth*
 - *lunulatus*, Mg. *Cornwall* (V.); *Land's End* (Baily)
 - *transfugus*, L. *Cornwall* (V.); *Marazion and Land's End* (Baily)
 - *lineatus*, F. *E. Cornwall* (M.); *Looe* (A.); *Liskeard; Swanpool, Falmouth*
 - Merodon equestris*, F. Though evidently a recent importation to Cornwall, this fly has unfortunately established itself in many parts of the county and in the larval stage causes at times a great deal of damage to narcissus bulbs, more especially by eating its way through them from the base upwards. In 1896 it seriously injured the narcissus beds of the flower-growers in *W. Cornwall*, and seems now to spread throughout the whole county from the *Tamar* to the *Isles of Scilly* wherever daffodil bulbs are grown in quantity. In 1897 the fly was reported by Marshall to be plentiful in his garden at *Botus-Fleming*. The following year several of the *Penryn* growers suffered severely from its attack. Injured bulbs have during the past seven years been sent in from all the important growing districts and from many gardens in the north, east, and south of the county as well

CYCLORRHAPHA (continued)

PROBOSCIDEA (continued)

SYRPHIDAE (continued)

- Criorrhina berberina*, F. *Cornwall* (V.); *Botus-Fleming*, June 1897 (M.)
- *oxyacanthae*, Mg. Occurs occasionally at hawthorn in *Bishop's Wood, Truro* (T.); *W. Cornwall* (D.)
- *floccosa*, Mg. *Cornwall* (V.); *Garnanton Woods, Mawgan-in-Pyder* (L.); common on hawthorn, *Bishop's Wood, Truro*
- *asilica*, Flin. Occasionally taken about *Penzance*
- Xylota segnis*, L. On undergrowth in the *Cascade Wood, Trebartha*, 6 September, 1902; *Doublebois*; very common about *Truro* (T.); *Falmouth and Mawnan; W. Cornwall* (D.)
- *lenta*, Mg. *E. Cornwall* (M.); *Looe* (A.)
- *sylvarum*, L. *Launceston*; plentiful near *Trevillis, Liskeard*, 22 July, 1904; *Doublebois*
- Syritta pipiens*, L. *Millook*; abundant about *Launceston*, 16 September, 1904; common at *Liskeard*, 2 May, 1905; *Bodmin; Padstow* (L.); common at *Truro* (T.) and *Falmouth; W. Cornwall* (D.)
- Eumerus sabulonum*, Flin. One male at *Penzance*, 7 July, 1871 (V.)
- *ornatus*, Mg. *Paul, Penzance* (Baily)
- *strigatus*, Flin. *Padstow* (L.); *St. Ives; Penzance* (V.)
- Chrysoclams cuprea*, Scop. A single specimen taken by Tate on the trunk of a tree in the Grammar School garden, *Truro*, in May 1904, and another caught on the same tree-trunk a year later
- Arctophila mussitans*, F. Tate has taken altogether about a dozen on a patch of *Scabious* on *Kenwyn Hill, Truro; W. Cornwall* (D.)
- Sericomyia borealis*, Flin. Common above *Trebartha*, 29 August, 1902; plentiful about *Truro* (T.); *W. Cornwall* (D.)
- Chrysotoxum cautum*, Harr. One taken by Tate in *Boswigo Wood, Truro*
- *octomaculatum*, Curt. A single example taken by Tate near *Penwethers*
- *elegans*, Lw. *Padstow* (L.)
- *festivum*, L. *Padstow* (L.)
- *vernale*, Lw. A male taken at *Penzance* 13 July, 1871, named by Loew himself (V.)
- *bicinctum*, L. *Padstow* (L.)
- Microdon mutabilis*, L. *Liskeard*, 16 June, 1904

CONOPIDAE

- Conops flavipes*, L. *Looe* (A.); Tate says *Conops* is common at *Bishop's Wood, Truro*, but the species has not been determined
- Physocephala rufipes*, F. *Looe* (A.); *Padstow* (L.); *Bishop's Wood, Truro* (T.); *W. Cornwall* (D.)
- Oncomyia atra*, F. *Padstow* (L.); *W. Cornwall* (D.)
- Sicus ferrugineus*, L. *Bishop's Wood, Truro* (T.); *W. Cornwall* (D.)
- Myopa buccata*, L. *Padstow* (L.)
- *testacea*, L. *E. Cornwall* (M.); *Looe* (A.)

OESTRIDAE

- Gastrophilus equi*, F. The Horse Bot Fly. The fly though seldom caught is undoubtedly common in the county, and horses that live much in the open and receive little grooming suffer much from its attacks

INSECTS

CYCLORRHAPHA (continued)

PROBOSCIDEA (continued)

OESTRIDAE (continued)

- Gastrophilus nasalis*, L. *Mevagissey*
Hypoderma lineatum, Vill. *Launceston*; *Truro*
 — *bovis*, Deg. The Warble or Bot Fly. The swellings or 'bumps' produced on the backs of cattle by the parasitic larvae of this fly are only too well known to the Cornish farmer, though the fly itself is very rarely observed
Oestrus ovis, L. The Sheep Nostril Fly. Most of the larvae of this fly sent in to the schools have come from the east of the county

TACHINIDAE

- Phorocera serriventris*, Rnd. }
 — *pumicata*, Mg. } *W. Cornwall* (D.)
Gonia capitata, Deg.
Melanota volvulus, F.
Macquartia flavipes, Mg. *Middle Lynher*
Anthracomia melanoptera, Mg. *W. Cornwall* (D.)
Demoticus frontatus, Boh. *Looe* (A); *Launceston*
Myiobia fenestrata, Mg. Above *Trebartha*; *Altarnun*
 — *inanis*, Flin. Above *Trebartha*; near *Liskeard*
Olivieria lateralis, F. *W. Cornwall* (D.)
Micropalpus vulpinus, Flin. *Looe* (A); *W. Cornwall* (D.)
Erigone radicum, F. *Altarnun*; *Liskeard*
Echinomyia fera, L. *W. Cornwall*
Fabricia ferox, L. *Padstow* (L.)
Servillia lurida, F. Between *Liskeard* and *Doublebois*, 28 April, 1904
Siphona geniculata, Deg. *Millook*; *Altarnun*; *Liskeard*; *Truro* and *Falmouth*; probably generally distributed
Onesia sepulchralis, L. *E. Cornwall* (M.)
Sarcophaga carnaria, L. *W. Cornwall* (D.)
 — *nigriventris*, Mg. *Tresco*, *Isles of Scilly* (Y.)
Dexiosoma caninum, F. } *W. Cornwall* (D.)
Dexia rustica, F. }

MUSCIDAE

- Stomoxys calcitrans*, L. *Mount Edgumbe*; *Liskeard*; *Padstow* (L.); *Truro*; *Falmouth*; *W. Cornwall* (D.)
Haematobia stimulans, Mg. *Millook*; *Middle Lynher*; *Liskeard*; *Truro*.
Pollenia vespillo, F. Evidently generally distributed.
 — *rudis*, Fabr. *Millook*; *Middle Lynher*; *Liskeard*; *Padstow* (L.); *Newquay*; *Truro*
Myiospila mediotabunda, F. *Padstow* (L.)
Graphomyia maculata, Scop. Above *Trebartha*; *Altarnun*; *Padstow* (L.)
Musca domestica, L. } Generally distributed
 — *corvina*, F. }
Cyrtoneura stabulans, Flin. *W. Cornwall* (D.)
Morellia simplex, Lw. *E. Cornwall* (M.)
 — *hortorum*, Flin. *W. Cornwall* (D.)
Mesembrina meridiana, L. *Padstow* (L.); *W. Cornwall* (D.)
Pyrellia cyanicolor, Ztt. *E. Cornwall* (M.)
Calliphora erythrocephala, Mg. *E. Cornwall* (M.); *Looe* (A.); *Middle Lynher* (T.); *W. Cornwall* (D.)
 — *vomitaria*, L. Common at *Millook* in 1905; *Liskeard*; abundant at *Padstow* (L.); *Newquay*; *Truro* and *Falmouth*

CYCLORRHAPHA (continued)

PROBOSCIDEA (continued)

MUSCIDAE (continued)

- Euphoria cornicina*, F. *Launceston*; *Liskeard*; *Doublebois*; *Padstow* (L.); *Truro*; *Mawnan*; *W. Cornwall* (D.)
Lucilia caesar, L. *W. Cornwall* (D.)

ANTHOMYIDAE

- Polietes lardaris*, F. *W. Cornwall* (D.)
Hyetodesia lucorum, Flin. }
 — *umbratica*, Mg. } *W. Cornwall* (D.)
 — *errans*, Mg.
 — *signata*, Mg.
 — *erratica*, Flin.
 — *scutellaris*, Flin.
 — *pallida*, F.
Mydaea vespertina, Flin. } *W. Cornwall* (D.)
 — *pagana*, F.
Spilogaster duplicata, Mg. Males taken by Colonel Yerbury on *St. Martin's* and *Tresco*, *Isles of Scilly*
 — *communis*, Dsv. *W. Cornwall* (D.)
Hydrotaea irritans, (Flin.) } *W. Cornwall* (D.)
 — *dentipes*, F.
Ophyra leucostoma, W. *Padstow* (L.)
Hylemyia variata, (Flin.) } *W. Cornwall* (D.)
 — *pullula*, Ztt.
 — *strigosa*, F.
 — *coarctata*, Flin.
Anthomyia. One or two anthomyid larvae, whose specific identification is somewhat uncertain, do considerable damage to various members of the cabbage family and occasionally to turnips throughout the county by eating into the stems and roots, particularly in the earlier stages of growth
A. pluvialis, L. *W. Cornwall* (D.); *Penzance* district (Baily)
 — *radicum*, L. *Looe* (A.); *W. Cornwall* (D.)
 — *sulciventris*, Ztt. *Penzance* district (Baily)
Chortophila albescens, Ztt. *W. Cornwall* (D.)
Phorbia cepetorum, Meade. The larvae of this fly, or a closely allied species, destroy large numbers of spring-sown onions every year by eating into the bulb when it is still small. This species has been recorded by Colonel Yerbury from *St. Martin's*, *Scilly*
Pegomyia betae, Curt. The beet fly. This fly had not been observed in Cornwall till 1902, when crops of mangels at *Newquay* and *St. Agnes* received a severe check in June from the wholesale destruction of the foliage by the larvae. It was again noticed at *Newquay* in 1903, and some mangels were slightly affected near *Truro* in 1905
 — *bicolor*, W. *W. Cornwall* (D.)
Homalomyia scalaris, F. }
 — *canicularis*, L. } *W. Cornwall* (D.)
 — *mutica*, Ztt.
Caricea tigrina, F.
 — *means*, Mg.
Hoplogaster mollicula, Flin.
Fucellia fucorum, Flin. *W. Cornwall* (D.)
 — *maritima*, Hal. *W. Cornwall* (D.); *St. Martin's*, *Scilly* (Y.)

A HISTORY OF CORNWALL

CYCLORRHAPHA (continued)

PROBOSCIDEA (continued)

CORDYLURIDAE

- Cordylura ciliata*, Mg. *W. Cornwall* (D.)
Norellia spinimana, Fln. *Liskeard*; *Padstow* (L.); *Truro*; *W. Cornwall* (D.)
Scatophaga scybalaria, L. *E. Cornwall* (M.); *Liskeard*; *Truro*
— *lutaria*, F. *W. Cornwall* (D.)
— *stercoraria*, L. Plentiful at *Millook* in 1905; *Altarnun*; *Padstow* (L.); *Newquay*; abundant locally about *Truro*; *St. Martin's* and *Tresco*, *Scilly* (Y.)
— *squalida*, Mg. *W. Cornwall* (D.)
— *litorea*, Fln. *Liskeard*; *Padstow* (L.); common about *Truro*; *W. Cornwall* (D.); commonest species of the genus at *Scilly* (Y.)
— *villipes*, Ztt. *Padstow* (L.); not uncommon on *St. Martin's* and *Tresco*, *Isles of Scilly*, under seaweed, but found also on *rhododendron* leaves (Y.)

PHYCODROMIDAE

- Orygma luctuosum*, Mg. Not uncommon under seaweed at *Looe*; *Padstow* (L.); *Falmouth*; *St. Martin's* and *Tresco*, *Isles of Scilly* (Y.)
Phycodroma sciomyzina, Hal. *Padstow* (L.)
Coelopa pilipes, Hal. *Padstow* (L.); *Tresco*, *Scilly* (Y.)
Fucomyia gravis, Hal. *Padstow* (L.)
— *parvula*, Hal. *W. Cornwall* (D.)

HELOMYZIDAE

- Helomyza rufa*, Fln. *Padstow* (L.)
— *similis*, Mg. *Looe* (A.)
Eccoptomera longiseta. *Padstow* (L.)
Blepharoptera spectabilis, Lw. } *Padstow* district (L.)
— *ruficauda*, Ztt. }
— *flavicornis*, Lw. }
Heteromyza atricornis, Mg. *W. Cornwall* (D.)
— *commixta*, Coll. *Padstow* (L.)
Tephrochlamys rufiventris, Mg. *Padstow* (L.)
— *flavipes*, Ztt. *St. Martin's*, *Scilly* (Y.)

HETERONEURIDAE

- Heteroneura albigana*, Mg. *E. Cornwall* (M.)
Stomphastica tigrina, Fln. *W. Cornwall* (D.)

SCIOMYZIDAE

- Lucina fasciata*, Mg. Found sparingly along the coast from *Porthcothan* to *Harlyn*; very abundant in two extremely restricted spots, one at *Constantine* just opposite the bungalow standing close to the sea, the other on *Harlyn towans* (Lamb); *W. Cornwall* (D.)
Actora aestuum, Mg. } *Padstow* (L.)
Oedoparea buccata, Fln. }
Dryomyza flaveola, F. *Padstow* (L.); *W. Cornwall* (D.)
Neuroctena anilis, Fln. *Padstow* (L.)
Neottiophilum praeustum, Mg. *W. Cornwall* (D.)
Sciomyza cinerella, Fln. *Padstow* (L.); *W. Cornwall* (D.)
— *dubia*, Fln. *Padstow* (L.)

CYCLORRHAPHA (continued)

PROBOSCIDEA (continued)

SCIOMYZIDAE (continued)

- Tetanocera elata*, F. *Altarnun*; *W. Cornwall* (D.)
— *laevifrons*, Lw. *Padstow* (L.)
— *ferruginea*, Fln. *E. Cornwall* (M.); above *Trebartha*; *Bodmin*
— *robusta*, Lw. *E. Cornwall* (M.)
— *coryleti*, Scop. *E. Cornwall* (M.)
— *umbrarum*, L. *W. Cornwall* (D.)
— *punctulata*, Scop. *Padstow* (L.)
Limnia marginata, F. *Padstow* (L.); *St. Ives*
— *unguicornis*, Scop. } *Padstow* district (L.)
— *rufifrons*, F. }
— *obliterata*, F. }
Elgiva albiseta, Scop. } *Padstow* district (L.)
— *dorsalis*, F. }
— *cucularia*, L. } *W. Cornwall* (D.)
Sepedon sphegeus, F. }
— *spinipes*, Scop. *Padstow* (L.)

PSILIDAE

- Psila fimetaria*, L. } *Padstow* (L.)
— *pallida*, Fln. }
— *rosae*, F. The carrot fly. In 1904 a large bed of carrots near *Truro*, intended for market, was almost entirely destroyed by the larvae of this fly. About 1900 there were one or two bad attacks in the *Penzance* district.
— *nigricornis*, Mg. *Padstow* (L.)
Loxocera albiseta, Schrk. *E. Cornwall* (M.); *Padstow* (L.)
— *sylvatica*, Mg. *E. Cornwall* (M.)
Lissa loxocerina, Fln. *W. Cornwall* (D.)

MICROPEZIDAE

- Micropeza lateralis*, Mg. } *W. Cornwall*
Calobata petronella, L. }

ORTALIDAE

- Pteropaectria nigrina*, Mg. *W. Cornwall* (D.)
— *palustris*, Mg. *Padstow* (L.)
— *oscillans*, Mg. *W. Cornwall* (D.)
— *frondescentiae*, L. *Middle Lynher*; *Padstow* (L.)
Platystoma seminationis, F. *W. Cornwall* (D.)
Rivellia syngenesiae, F. } *Padstow* (L.)
Seoptera vibrans, L. }

TRYPETIDAE

- Acidia heraclei*, L. *Padstow* (L.); *W. Cornwall* (D.)
Spilographa Zoë, Mg. *Padstow* (L.)
Trypeta jaceae, Dsv. *Padstow* (L.)
— *onotrophes*, Lw. *Altarnun*; *St. Ives*
— *cornuta*, F. *Padstow* (L.); *W. Cornwall* (D.)
— *tussilaginis*, F. *E. Cornwall* (M.)
— *florescentiae*, L. *Padstow* (L.)
— *colon*, Mg. *W. Cornwall* (D.)
— *serratae*, L. *Padstow* (L.)
Urophora solstitialis, L. } *Padstow* (L.)
— *stylata*, F. }
— *cardui*, L. The galls produced by this fly are at times very conspicuous features on thistle stems
Sphenella marginata, Fln. *Padstow* (L.)
Ensina sonchi, L. *Padstow* (L.); *W. Cornwall* (D.)

INSECTS

CYCLORRHAPHA (continued)

PROBOSCIDEA (continued)

TRYPETIDAE (continued)

- Tephritis miliaria*, Schrk. *Padstow* (L.)
 — *corniculata*, Fln. }
 — *absinthii*, F. } *W. Cornwall* (D.)
 — *hyoscyami*, L. }
 — *guttatofasciata* (?), Lw. 'The insect provisionally placed under this name is extremely like the figure and description given by Loew. It cannot with certainty be introduced so far, but the doubt as to identification is very small' (Lamb in *lit.*)
T. vespertina, Lw. } *Padstow* (L.)
 — *bardanae*, Schrk. }
Urellia eluta, Mg. *Padstow* (L.)
 — *stellata*, Fuessl. *Padstow* (L.); *W. Cornwall* (D.)

LONCHAEIDAE

- Palloptera ustulata*, Fln. } *Padstow* (L.); *W. Cornwall*
 — *umbellatarum*, F. } (D.)
 — *trimacula*, Mg. *W. Cornwall* (D.)
 — *arcuata*, Fln. } *Padstow* (L.)
 — *usta*, Mg. }
Toxoneura muliebris, Harr. *Padstow* (L.); *W. Cornwall* (D.)
Peplomyza Wiedemanni, Lw. *Padstow* (L.)
Sapromyza longipennis, F. *W. Cornwall* (D.)
 — *fasciata*, Fln. *Padstow* (L.)
 — *inusta*, M. } *W. Cornwall* (D.)
 — *decempunctata*, Fln. }
 — *quadripunctata*, L. *Padstow* (L.)
 — *rorida*, Fln. *Padstow* (L.); *W. Cornwall* (D.)
 — *praeusta*, Fln. *W. Cornwall* (D.)
 — *plumicornis*, Fln. *Padstow* (L.)
Lauxania aenea, Fln. *Padstow* (L.); *W. Cornwall* (D.)

OPOMYZIDAE

- Balioptera tripunctata*, Fln. }
 — *combinata*, L. } *Padstow* (L.)
 — *venusta*, Mg. }
Opomyza germinationis, L. *W. Cornwall* (D.)
 — *florum*, F. *Padstow* (L.)
Pelethophila flava, L. *Padstow* (L.)

SEPSIDAE

- Sepsis punctum*, F. } *W. Cornwall* (D.)
 — *nigripes*, Mg. }
Nemopoda stercoraria, Dsv. } *W. Cornwall* (D.)
 — *nigricornis*, Mg. }
Thermira minor, Hal. }
Saltella sphondylii, Schrk. *Padstow* (L.)

PIOPHILIDAE

- Piophila casei*, L. *W. Cornwall*
 — *nigriceps*, Mg. } *Padstow* (L.)
Madiza glabra, Fln. }
 — *rufitarsis*, Mg. *Scilly* (J.)

GEOMYZIDAE

- Anthomyza gracilis*, Fln. *Padstow* (L.); *W. Cornwall* (D.)
 — *flavipes*, Ztt. *Padstow* (L.)
Geomyza obscurella, Fln. *Padstow* (L.)
Diastata punctum, Mg. *W. Cornwall* (D.)

CYCLORRHAPHA (continued)

PROBOSCIDEA (continued)

EPHYDRIDAE

- Notiphila uliginosa*, Hal. } *W. Cornwall* (D.)
 — *riparia*, Mg. }
Discomyza incurva, Fln. } *Padstow* (L.)
Psilopa leucostoma, Mg. }
 — *nitidula*, Fln. }
Athyroglossa ordinata, Bech. Not uncommon on *Constantine towans*. The common species *A. glabra* does not seem to be present (Lamb)
Hecamede albicans, Mg. 'Common in suitable places. The ordinary statement that this insect is generally found on rocks is as far as I know erroneous. It is very rarely seen there, but can readily be obtained by sweeping the marram grass on the cliff edges near the sea. In this way it can be taken commonly at *Harlyn* and *Trevone*' (Lamb in *lit.*); *W. Cornwall* (D.)
Hydrellia griseola, Fln. *Padstow* (L.); *W. Cornwall* (D.); *St. Martin's, Scilly* (Y.)
Philhygia punctatonervosa, Fln. *Padstow* (L.); *W. Cornwall* (D.)
 — *interrupta*, Hal. *Padstow* (L.)
Hyadina guttata, Fln. *Padstow* (L.); *W. Cornwall* (D.)
Axysta cesta, Hal. *W. Cornwall* (D.)
Pelina aenescens, Stnh. *Padstow* (L.)
Ochthera mantis, Deg. *Padstow* (L.)
 — *mantispa*, Loew. 'One specimen swept just below the bridge in *Porthcothan Bay*—a very interesting capture since the insect is a southern form' (Lamb)
Canace nasica, Hal. Common in *Porthcothan Bay* on the green weed on the sides of rocks and in similar places in all the bays around (Lamb)
Parhydra quadripunctata, Mg. *St. Martin's, Scilly* (Y.)
 — *coarctata*, Fln. *Padstow* (L.); *St. Martin's, Scilly* (Y.)
Ephydra riparia, Fln. } *W. Cornwall* (D.)
Ilythea spilota, Hal. }
Scatella quadrata, Fln. *Padstow* (L.); *W. Cornwall*
 — *sibilans*, Hal. *Padstow* (L.)
 — *sorbillans*, Hal. } *Padstow* (L.)
 — *aestuans*, Hal. }
 — *stagnalis*, Fln. }
 — *noctula*, Mg. *W. Cornwall* (D.)
Mosillus subsultans, F. *Padstow* (L.)

DROSOPHILIDAE

- Scaptomyza graminum*, Fln. *Padstow* (L.)
Drosophila transversa, Fln. *W. Cornwall* (D.)
 — *fenestrarum*, Fln. *Padstow* (L.); *W. Cornwall* (D.)
 — *confusa*, Staeg. } *Padstow* (L.)
 — *funebis*, F. }
Noterophila glabra, Fln. *Padstow* (L.)

CHLOROPIDAE

- Camarota flavitarsis*, M. *Padstow* (L.); *W. Cornwall* (D.)
Meromyza pratorum, Mg. } *Padstow* (L.); *W. Cornwall* (D.)
 — *saltatrix*, L. }
 — *variegata*, Mg. *W. Cornwall* (D.)
 — *laeta*, Mg. *Padstow* (L.)

A HISTORY OF CORNWALL

CYCLORRHAPHA (*continued*)

PROBOSCIDEA (*continued*)

CHLOROPIDAE (*continued*)

Centor cereris, Fln. *W. Cornwall* (D.)
Eutropha fulvifrons, Hal. *Padstow* (L.)
Diplotoxa messoria, Fln. *Padstow* (L.) ; *W. Cornwall* (D.)

Chlorops taeniopus, Mg. The Gout Fly. In some years this fly causes serious injury to the barley crops of the county by laying its eggs in the sheathing leaves in close proximity to the forming ear while the plant is still young. In 1887 it did great damage in the county, and in 1897 many fields of barley suffered severely. Since that time its ravages have not been very serious, though affected ears are frequently sent in for identification

Chloropisca ornata, Mg. } *Padstow* (L.)
 — *glabra*, Mg. }

Oscinis frit, L. The Frit Fly. In Cornwall at least this fly confines its attention exclusively to oats and in dredge corn leaves the barley unscathed. In 1888 the fly was remarkably prevalent in Cornwall and Devon, and on many farms throughout the former county destroyed the oat crops to a disastrous extent. It was common about *Bodmin* and in the *Blisland* district in 1902, but has not been noticed since that date

Elachyptera brevipennis, Mg. *W. Cornwall* (D.)
 — *cornuta*, Fln. *Scilly* (J.)

AGROMYZIDAE

Ceratomyza denticornis, Pz. }
Leucopis griseola, Fln. } *Padstow* (L.)
Ochthiphila polystigma, Mg. }
 — *juncorum*, Fln. *Padstow* (L.) ; *W. Cornwall* (D.)
 — *aridella*, Fln. *W. Cornwall* (D.)
 — *flavipalpis*, Hal. *Padstow* (L.)

CYCLORRHAPHA (*continued*)

PROBOSCIDEA (*continued*)

AGROMYZIDAE (*continued*)

Schoenomyza litorella, Fln. *Padstow* (L.) ; *St. Martin's, Scilly* (Y.)
 — *fasciata*, Mg. *Padstow* (L.)

PHYTOMYZIDAE

Napomyza lateralis, Fln. *W. Cornwall* (D.)
Chromatomyia obscurella, Fln. *W. Cornwall* (D.)

ASTIADAE

Astia amoena, Mg. *Looe* (A.) ; *W. Cornwall* (D.)

BORBORIDAE

Borborus nitidus, Mg. *W. Cornwall* (D.) ; *St. Martin's, Scilly* (Y.)
 — *equinus*, Fln.
Sphaerocera subsultans, F. } *W. Cornwall* (D.)
 — *vaporariorum*, Hal. }
Limosina Zosteræ, Hal. }
 — *sylvatica*, Mg. }

PHORIDAE

Conicera atra, Mg. }
Trineura aterrima, F. } *W. Cornwall* (D.)
Phora rufipes, Mg. }
 — *flava*, Fln. }

HIPPOBOSCIDAE

Ornithomyia avicularia, L. *Looe* (A.) ; *W. Cornwall* (D.)
Melophagus ovinus, L. The so-called Sheep Tick.

HEMIPTERA HETEROPTERA

A list by Mr. E. D. Marquand of the Hemiptera Heteroptera collected by him in the Penzance district, in the *Transactions of the Penzance Natural History and Antiquarian Society* (new series), vol. ii, and a note by Mr. G. C. Champion in the *Entomologists' Monthly Magazine*, xxxiii, on his captures at Scilly, together with records by the Rev. T. A. Marshall, Dr. Mason, the Messrs. Dale, Mr. G. C. Champion, Mr. E. A. Newbery, Mr. J. J. Walker, and others referred to in Saunders's monograph, constitute the principal published data on county Heteroptera. The writer has to thank Mr. J. H. Keys not only for a MS. list of his own captures about Whitsand Bay east, but for valuable notes from Mr. E. A. Newbery and Mr. G. C. Champion.

The Heteroptera of the county include some rare and interesting forms. *Eurygaster maura* was taken by J. C. Dale at Land's End. *Geotomus punctulatus* was found by Saunders at Whitsand Bay, Land's End, in 1864, under stones and among *Erodium*, and G. C. Champion obtained it in the same locality in August, 1897. *Pentatoma baccarum* has been captured at Tregantle, at Gerran's Bay, at Land's End, and at Scilly. The rare *Strachia oleracea* was found by Dale at Kynance Cove. *Picromerus bidens* and the beautiful steel-blue *Zicrona coerulea* are not infrequently found in the Land's End district, and the latter has also occurred at Tregantle. *Enoplops scapha* has been recorded for Mount Edgcumbe, Whitsand Bay East, Falmouth, and Land's End. The quaint *Verlusia rhombea* was found many years ago by J. J. Walker at Whitsand Bay East. *Alydus calcaratus* occurs at Downderry and in the Land's End district in company with *Formica rufa*. The pretty *Therapha hyoscyami* with its striking display of red and black was taken in some numbers on the wing at Boscastle by Keys in June, 1898, and some years previously by C. W. Dale near the Land's End. *Metacanthus punctipes* was one of Walker's finds at Whitsand Bay East. *Henestaris laticeps* occurs locally all along the south coast from Tregantle to Land's End. *H. balophilus* was another of the good things found by Walker at Whitsand Bay. That very local species,

INSECTS

Rhyparochromus praetextatus, occurs at St. Ives, and the nearly related *R. antennatus* near Land's End. The cliffs near Boscastle, where it was found by the Rev. T. A. Marshall, appear to be the only known British habitat for *Trapezonotus Ullrichi*. *Aphanus rolandri* was found in July, 1901, under some blown hay near Liskeard, and *A. lynceus* has twice been taken at St. Ives. That elegant and beautiful insect, *Beosus luscus*, is widely spread, and though taken most frequently about Whitsand Bay East, occurs also at Boscastle, St. Ives, Gerrans Bay, and Land's End. The very rare *Emblethis verbasci* was obtained by Champion at St. Mary's, Tresco and Samson, Scilly. The first specimens of the extraordinary sub-marine hemipteron *Aepophilus bonnairei*, found in England, were obtained by F. Smith, near Polperro, in 1879. A second colony was discovered by E. D. Marquand in 1886 at Mousehole on the very border of the laminarian zone. The developed form of *Velia currens* has been taken near Tintagel, and that of *Nabis lativentris* occurred near Marazion in 1901. The rare *Lopus flavomarginatus* was obtained by Marshall at Polperro, and *L. sulcatus* has been taken lately by Keys at Tregantle. *Phytocoris reuteri* appeared in a small orchard near Newquay in 1900. *Allodapus rufescens* was found among the Isles of Scilly by Mason. *Orthotylus nascatus* occurs in the oak-lined coombes of the Kilkhampton district and also around Penzance. *Plagiognathus saltitans* has been taken sparingly all over the west of the county, and *Macrocoleus tanacetis* is not uncommon near Launceston.

HETEROPTERA

GYMNOCERATA

PENTATOMINA

SCUTELLERIDAE

Corimelaena, White
— scarabaeoides, L.
Eurygaster, Lap.
— maura, L.
Podops, Lap.
— inuncta, Fabr. *Whitsand Bay*
(Keys); *Falmouth*

CYDNIDAE

Geotomus, Muls and Rey
— punctulatus, Costa
Sehirus, Am. S.
— bicolor, L.
— biguttatus, L.
Gnathoconus, Fieb.
— albomarginatus, Fabr. *Whitsand Bay* (J. J. Walker)

PENTATOMIDAE

Neottiglossa, Curt.
— inflexa, Wolff
Pentatoma, Oliv.
— fuscispina, Boh.
— baccarum, L. Sc.¹
— prasina, L.
Piezodorus, Fieb.
— lituratus, Fabr.
Tropicoris, Hahn
— rufipes, L.
Strachia, Hahn
— oleracea, L.

ASOPIDAE

Picromerus, Am. S.
— bidens, L.
Asopus, Burm.
— punctatus, L.

¹ Where species that are common on the mainland have been taken at Scilly their names are marked 'Sc.' on the list.

GYMNOCERATA (cont.)

PENTATOMINA (cont.)

ASOPIDAE (cont.)

Zicrona, Am. S.
— coerulea, L.

ACANTHOSOMINA

Acanthosoma, Curt.
— haemorrhoidale, L.
— interstinctum, L.

COREINA

COREIDAE

Enoplops, Am. S.
— scapha, Fabr.
Syromastes, Latr.
— marginatus, L.
Verlusia, Spin.
— rhombea, L.
Coreus, Fabr.
— denticulatus, Scop.

ALYDIDAE

Alydus, Fabr.
— calcaratus, L.

STENOCEPHALIDAE

Stenocephalus, Latr.
— agilis, Scop. Sc.
— neglectus, H. S.
Therapha, Am. S.
— hyoscyami, L.

CORIZIDAE

Myrmus, Hahn.
— myriformis, Fall. *Bude* (Big-nell); moors near *St. Austell*
Chorosoma, Curt.
— schillingi, Schml.

BERYTINA

BERYTIDAE

Berytus, Fabr.
— minor, H. S. *Camelford*; *Gram-pound*

GYMNOCERATA (cont.)

BERYTINA (cont.)

BERYTIDAE (cont.)

Berytus signoreti, Fieb. *Valley of the Lynher*; *Looe*; *Truro*; *Falmouth*

METACANTHIDAE

Metacanthus, Cost.
— punctipes, Germ.

LYGAEINA

LYGAEIDAE

Nysius, Dall.
— thymi, Wolff. Sc.

CYMIDAE

Cymus, Hahn.
— glandicolor, Hahn.
— claviculus, Fall.
Ischnorhynchus, Fieb.
— resedae, Panz.
— geminatus, Fieb.

HENESTARIDAE

Henestaris, Spin.
— laticeps, Curt.
— halophilus, Burm.

HETEROGASTRIDAE

Heterogaster, Schill.
— urticae, Fabr. Sc.

PACHYMERIDAE

Rhyparochromus, Curt.
— praetextatus, H. S. *St. Ives* (Mason)
— antennatus, Schill. *Falmouth*; *Land's End* (Dale)
— dilatatus, H. S.
— chiragra, Fabr. Sc.

A HISTORY OF CORNWALL

GYMNOCERATA (cont.)

LYGAEINA (cont.)

PACHYMERIDAE (cont.)

- Ischnocorus*, Fieb.
 — *angustulus*, Boh.
Macrodera, Fieb.
 — *micropterum*, Curt. *Bodmin*;
Truro; *Penzance* district
 (Marquand)
Plinthisus, Fieb.
 — *brevipennis*, Latr. *Whitsand*
Bay (Keys); *Polperro* (Mar-
 shall); *St. Ives* (Mason);
Scilly
Acompus, Fieb.
 — *rufipes*, Wolff. *Land's End*
 (Dale)
Stygnus, Fieb.
 — *rusticus*, Fall.
 — *pedestris*, Fall.
 — *arenarius*, Hahn. Sc.
Peritrechus, Fieb.
 — *nubilus*, Fall. *River Gannel*,
Newquay
 — *luniger*, Schill. *Whitsand Bay*
 (Keys); *Downderry* (Bignell);
Portscatho; *Falmouth*; *St. Ives*
 and *Scilly* (Mason)
Trapezonotus, Fieb.
 — *agrestis*, Panz.
 — *ullrichii*, Fieb.
Aphanus, Lap.
 — *rolandri*, L.
 — *lynceus*, Fabr.
 — *pini*, L.
Beosus, Am. S.
 — *luscus*, Fabr.
Eremocorus, Fieb.
 — *podagricus*, Fab. *Millook* (Rev.
 G. L. Allen)
Emblethis, Fieb.
 — *verbasci*, Fab. Sc.
Drymus, Fieb.
 — *sylvaticus*, Fabr.
 — *brunneus*, Sahlb.
Notochilus, Fieb.
 — *contractus*, H. S.
Scolopostethus, Fieb.
 — *affinis*, Schill.
 — *neglectus*, Edw.
 — *decoratus*, Hahn. Sc.
Gastrodes, Westw.
 — *ferrugineus*, L. *Kilhampton*;
Scotch pines, *Doublebois*

TINGIDINA

PIESMIDAE

- Piesma*, Lap.
 — *quadrata*, Fieb. *Liskeard*;
Doublebois; *Falmouth*
 — *capitata*, Wolff. *Millook*

TINGIDIDAE

- Orthostira*, Fieb.
 — *brunnea*, Germ. *Coombe Valley*,
Kilhampton; *Millook*

GYMNOCERATA (cont.)

TINGIDINA (cont.)

TINGIDIDAE (cont.)

- Orthostira parvula*, Fall. *Tregantle*
 (Keys); *Liskeard*; *Truro*;
Falmouth; *Penzance* district
 (Marquand)
Dictyonota, Curt.
 — *crassicornis*, Fall.
 — *strichnocera*, Fieb. *Liskeard*,
 on firs and pines
Derephysia, Spin.
 — *foliacea*, Fall.
Monanthia, Lep.
 — *ampliata*, Fieb.
 — *cardui*, L. Sc.
 — *dumetorum*, H. Schiff.

ARADINA

- Aradus*, Fabr.
 — *depressus*, Fabr.

HYDROMETRINA

AEOPOPHILIDAE

- Aeopophilus*, Sign.
 — *bonnairei*, Sign.

HYDROMETRIDAE

- Hydrometra*, Latr.
 — *stagnorum*, L.

VELIIDAE

- Velia*, Latr.
 — *currens*, Fabr.

GERRIDAE

- Gerris*, Fabr.
 — *najas*, De G.
 — *thoracica*, Schum.
 — *gibbifera*, Schum.
 — *lacustris*, L.
 — *odontogaster*, Ztt.
 — *argentata*, Schum. Several fe-
 males in a meadow, *Saltmills*,
Saltash, 24 May (G. C.
 Bignell)

REDUVIINA

REDUVIIDAE

- Reduvius*, Fabr.
 — *personatus*, L. *Falmouth*
Coranus, Curt.
 — *subapterus*, De G. Heathy
 places, *Falmouth*; *Land's*
End (Dale)

NABIDAE

- Nabis*, Latr.
 — *lativentris*, Boh.
 — *major*, Cost.
 — *limbatus*, Dahlb.

GYMNOCERATA (cont.)

REDUVIINA (cont.)

NABIDAE (cont.)

- Nabis ferus*, L.
 — *rugosus*, L.

SALDINA

- Salda*, Fabr.
 — *pallipes*, Fabr. Sc.
 — *littoralis*, L. *Downderry* (Keys);
Falmouth
 — *orthochila*, Fieb.
 — *lateralis*, Fall. *Falmouth*; *St.*
Ives (Mason)
 — *c-album*, Fieb.
 — *saltatoria*, L. Sc.
 — *cincta*, H. S. *Marazion*; *Land's*
End (J. C. Dale)

CIMICINA

CIMICIDAE

- Cimex*, L.
 — *lectularius*, L.
 — *columbarius*, Jen.

ANTHOCORIDAE

- Lyctocoris*, Hahn.
 — *campestris*, Fall. One in valley
 of the *Lynher*
Piezostethus, Fieb.
 — *galactinus*, Fieb.
 — *cursitans*, Fall.
Anthocoris, Fall.
 — *confusus*, Reut.
 — *nemoralis*, Fabr.
 — *gallarum-ulmi*, De G.
 — *sylvestris*, L.
Acompocoris, Reut.
 — *pygmaeus*, Fall.
Triphleps, Fieb.
 — *niger*, Wolff. *Newquay*
 — *majuscula*, Reut. *Botus Flem-*
ing
 — *minuta*, L.

MICROPHYSINIDAE

- Microphysa*, Westw.
 — *elegantula*, Baer. Beaten out
 of whitethorn hedge, *Botus*
Fleming (G. C. Bignell);
Liskeard; *Malpas*

CAPSINA

CAPSIDAE

- Pithanus*, Fieb.
 — *maerkeli*, H. S.
Miris, Fabr.
 — *holsatus*, Fabr.
 — *calcaratus*, Fall.
 — *laevigatus*, L.
Megaloceroea, Fieb.
 — *erratica*, L.

INSECTS

GYMNOCERATA (cont.)

CAPSINA (cont.)

CAPSIDAE (cont.)

- Megaloceroea longicornis, Fall. *St.*
Ives (Mason)
 — ruficornis, Fourc.
 Leptopterna, Fieb.
 — ferrugata, Fall.
 — dolabrata, L.
 Bryocoris, Fall.
 — pteridis, Fall.
 Monalocoris, Dahlb.
 — filicis, L.
 Pantilius, Curt.
 — tunicatus, Fabr.
 Lopus, Hahn.
 — sulcatus, Fieb.
 — flavomarginatus, Don.
 Phytocoris, Fall.
 — populi, L.
 — tiliac, Fabr.
 — longipennis, Flor.
 — reuteri, Saund. *Newquay*
 — varipes, Boh.
 — ulmi, L.
 Calocoris, Fieb.
 — striatellus, Fabr.
 — fulvomaculatus, De G.
 — sexguttatus, Fabr.
 — bipunctatus, Fabr.
 — chenopodii, Fall.
 — roseomaculatus, De G.
 — infusus, H. S.
 — striatus, L.
 Oncognathus, Fieb.
 — binotatus, Fabr.
 Lygus, Hahn.
 — pratensis, Fabr.
 — contaminatus, Fall.
 — lucorum, Mey.
 — viridis, Fall.
 — pabulinus, L.
 — pastinacae, Fall.
 — cervinus, H. S.
 — kalmii, L.
 — rubricatus, Fall. *Valley of the*
Lynher ; Liskeard
 Zygimus, Fieb.
 — pinastri, Fall.
 Poeciloscytus, Fieb.
 — unifasciatus, Fabr.
 Liocoris, Fieb.
 — tripustulatus, Fabr.
 Capsus, Fabr.
 — laniarius, L.
 — scutellaris, Fabr.

GYMNOCERATA (cont.)

CAPSINA (cont.)

CAPSIDAE (cont.)

- Rhopalotomus, Fieb.
 — ater, L.
 Allodapus, Fieb.
 — rufescens, H. S. *Sc.*
 Labops, Burm.
 — saltator, Hahn.
 Dicyphus, Fieb.
 — errans, Wolff
 — globulifer, Fall.
 Campyloneura, Fieb.
 — virgula, H. S.
 Cylocoris, Hahn.
 — histrionicus, L.
 — flavonotatus, Boh.
 Aetorhinus, Fieb.
 — angulatus, Fabr.
 Mecomma, Fieb.
 — ambulans, Fall.
 Cyrtorrhinus, Fieb.
 — caricis, Fall.
 Orthotylus, Fieb.
 — tenellus, Fall.
 — flavinervis, Kb.
 — nassatus, Fabr.
 — flavosparus, Sahlb.
 — chloropterus, Kb.
 — ericetorum, Fall.
 Malacocoris, Fieb.
 — chlorizans, Fall.
 Loxops, Fieb.
 — coccinea, Mey.
 Heterotoma, Latr.
 — merioptera, Scop.
 Heterocordylus, Fieb.
 — tibialis, Hahn.
 Macrotylus, Fieb.
 — paykulli, Fall.
 Hoplomachus, Fieb.
 — thunbergi, Fall.
 Macrocoleus, Fieb.
 — molliculus, Fall. *Fowey ; Fal-*
mouth
 — tanacetii, Fall. *Padstow*
 Harpocera, Curt.
 — thoracica, Fall.
 Byrsoptera, Spin.
 — rufifrons, Fall.
 Phylus, Hahn.
 — melanocephalus, L.
 — coryli, L.
 Psallus, Fieb.
 — ambiguus, Fall.
 — betuleti, Fall.

GYMNOCERATA (cont.)

CAPSINA (cont.)

CAPSIDAE (cont.)

- Psallus variabilis, Fall.
 — fallenii, Reut.
 — varians, H. S.
 — sanguineus, Fabr.
 — salicellus, Mey.
 Plagiognathus, Fieb.
 — viridulus, Fall.
 — arbustorum, Fabr.
 — albipennis, Fall.
 Asciodema, Reut.
 — obsoletum, D. & S.

CRYPTOCERATA

NAUCORIDINA

- Naucoris, Geoffr.
 — cemicoides, L.

NEPINA

- Nepa, L.
 — cinerea, L.
 Ranatra, Fabr.
 — linearis, L.

NOTONECTINA

- Notonecta, L.
 — glauca, L.
 Plea, Leach
 — minutissima, Fabr.

CORIXINA

- Corixa, Geoffr.
 — geoffroyi, Leach
 — atomaria, Illig.
 — lugubris, Fieb. *Sc.*
 — hieroglyphica, Duf.
 — sahlbergi, Fieb.
 — semistriata, Fieb.
 — striata, L.
 — fallenii, Fieb.
 — distincta, Fieb.
 — moesta, Fieb.
 — fabricii, Fieb.
 — fossarum, Leach
 — scotti, Fieb.
 — coleoptrata, Fabr.
 Sigara, Fabr.
 — minutissima, L.

HOMOPTERA

The Homoptera of Cornwall have received very little attention. Mr. J. C. Dale collected these insects in various parts of the county, and Mr. E. Saunders took a few at Penzance, but till lately that was practically all that had been done. In 1903 and 1904 the writer, with the enthusiastic co-operation of several of the members of his Nature Study Class, collected them intermittently in various parts of the county, but particularly in the neighbourhood of Truro and Falmouth. The list that follows contains ninety-three Cicadina and only eight Psyllina. It is manifestly imperfect,

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but consists of species that have with certainty been identified in the Schools' collection, together with such additional ones as are recorded by the entomologists already mentioned.

The best known member of the sub-order is the universally distributed *Philaenus spumarius*, one of the frog-hoppers that in the immature stages secretes and protects itself with a large mass of froth forming the familiar frog-spit, so much dreaded by Cornish children, and about which there are so many traditions of evil in the folklore of the county. The largest species in Cornwall is the quaint and rare *Ledra crinita*, the biggest of which, taken near Launceston, measured exactly three-quarters of an inch in length. Many of the species are in places extraordinarily abundant. The elm trees about Truro literally swarm at times with Typhocybiidae, and in the last few days of June, 1902, immense clouds of *Eupteryx auratus* arose whenever the rank herbage on some unoccupied house-sites at Newquay was disturbed.

The county list includes the curious *Issus coleoptratus*, which in the nymph condition is fairly common on a hedgebank near Pencalenick, Truro; the striking *Tricophora vulnerata*, in blood-red and black, from near Calstock; and the very local *Liburnia lepida* from Looe. *Bythoscopus rufusculus* is not uncommon on willows at Scilly, and in 1904 *Pediopsis tibialis* was plentiful on the brambles in a country lane near Penryn. The Lizard is evidently the only known British locality for *Agallia similis*. *Platymetopius undatus* has lately been taken on bracken in the Luxulian Valley, and the rare and local *Deltocephalus striifrons* on retharrow close to Falmouth. *D. socialis* occurred rather sparingly in 1905 near St. Clement's, Truro. Three specimens of *Limotettix nigricornis* were taken on two separate occasions about a week apart at Botus Fleming. *Eupteryx melissae* was taken by Dale on tree-mallow at Scilly, and in 1903 by Price on the island of Roseveare. *E. filicum* was found by Mrs. Clark in 1905 on the lady fern near Millook. *Arytaena genistae* was common for several weeks in 1904 in a great bank of furze near Kea, Truro. *Trioza galii* has been taken by Dale at Bude. *T. criethni* was plentiful at Whitsand Bay east in 1905.

HOMOPTERA

CICADINA

MEMBRACIDAE

Centrotus, Fabr.
— cosnutus, L.

TETTIGOMETRIDAE

Tettigometra, Latr.
— impresso-punctata, Sign. Valley
of the Lynher, rare

ISSIDAE

Issus, Fabr.
— coleoptratus, Geoff. Truro
Cixius, Latr.
— pilosus, Ol.
— cunicularis, L.
— nervosus, L.
— brachycranus, Fieb. Penzance
(Saunders)
— scotti, Edw. Penzance (Saunders)

DELPHACIDAE

Liburnia, Stal.
— lineola, Germ. Mount Edg-
cumbe (Dale)
— fuscovittata, Stal. Launceston
— vittipennis, J. Sahl.
— lepida, Boh. Looe
— fieberi, Scott. The Lizard
(Dale)
— pellucida, Fabr.
— striatella, Fall. Land's End
(Dale)
— fairmairi, Perris
— limbata, Fabr.
— mesomela, Boh. Newquay

CICADINA (cont.)

DELPHACIDAE (cont.)

Stiroma, Fieb.
— pteridis, Boh.

CERCOPIDAE

Triecphora, Am. et Serv.
— vulnerata, Illig. Calstock
Aphrophora, Germ.
— alni, Fall.
Philaenus, Stal.
— spumarius, L.
— campestris, Fall.
— lineatus, L.

LEDRIDAE

Ledra, Fabr.
— aurita, L. Launceston; Lis-
keard; Bishop's Wood, Truro

ULOPIDAE

Ulopa, Fall.
— reticulata, Fabr.

PAROPIDAE

Megophthalmus, Curt.
— scanicus, Fall.

BYTHOSCOPIIDAE

Macropsis, Lewis
— lanio, L.
Bythoscopus, Germ.
— alni, Schr.
— rufusculus, Fieb. Scilly
— flavicollis, L.

CICADINA (cont.)

BYTHOSCOPIIDAE (cont.)

Pediopsis, Burm.
— scutellatus, Boh.
— tibialis, Scott. Falmouth
— virescens, Fab.
Idiocerus, Lewis
— laminatus, Flor.
— lituratus, Fall.
— populi, L.
— albicans, Kbm.
Agallia, Curt.
— sinuata, Muls. Lizard (Dale)
— puncticeps, Germ.
— venosa, Fall.

TETTIGONIDAE

Evacanthus, Lep. et Serv.
— interruptus, L.
Tettigonia, Geoff.
— viridis, L.

ACOCEPHALIDAE

Strongylocephalus, Flor.
— agrestis, Fall.
Acocephalus, Germ.
— nervosus, Schrk.
— bifasciatus, L. Falmouth
— albifrons, L.
— histrionicus, Fabr. Newquay
— flavostriatus, Don.
Eupelix, Germ.
— cuspidata, Fabr.
Platymetopius, Burm.
— proceps, Kb. Falmouth (Dale)

INSECTS

CICADINA (*cont.*)

JASSIDAE

- Athysanus, Burm.
- communis, J. Sahl.
- sordidus, Ztt.
- obscurellus, Kbm.
- obsoletus, Kbm.
- Deltocephalus, Burm.
- striifrons, Kbm. *Falmouth*
- pascuellus, Fall.
- distinguendus, Flor.
- socialis, Flor. *Truro*
- sabulicola, Curt.
- striatus, L.
- normani, Scott.
- Allygus, Fieb.
- mixtus, Fabr.
- Thamnottettix, Ztt.
- prasina, Fall. *Par; Falmouth*
- subfuscula, Fall.
- splendidula, Fabr.
- crocea, H. S.
- attenuata, Germ.
- Limotettix, J. Sahl.
- striola, Fall.
- quadrinotata, Fabr.
- nigricornis, J. Sahl. *Botus*
- Fleming*

CICADINA (*cont.*)

JASSIDAE (*cont.*)

- Cicadula, Fieb.
- sexnotata, Fall.
- TYPHLOCYBIDAE
- Alebra, Fieb.
- albostricella, Fall.
- Kybos, Fieb.
- smaragdula, Fall.
- Chlorita, Fieb.
- flavescens, Fabr.
- viridula, Fall.
- Eupteryx, Curt.
- vittatus, L.
- urticae, Fabr.
- strachydearum, Hardy
- melissae, Curt. *Scilly (Dale)*
- auratus, L.
- filicum, Newm. *Millook (Mrs. Clark)*
- pulchellus, Fall.
- Typhlocyba, Germ.
- sexpunctata, Fall.
- ulmi, L.
- tenerrima, H. S.
- aurovittata, Dougl.

CICADINA (*cont.*)

TYPHLOCYBIDAE (*cont.*)

- Typhlocyba douglasi, Edw.
- rosae, L.
- quercus, Fabr.
- geometrica, Schr.
- Zygina, Fieb.
- flammigera, Geoff.
- parvula, Boh.

PSYLLINA

PSYLLIDAE

- Psylla, F. Loew
- simulans, Först.
- pyricola, Först.
- peregrina, Först
- Arytaena, Scott
- genistae, Latr. *Truro*

TRIOZIDAE

- Trioza, Först.
- galli, Först.
- urticae, L.
- crithmi, F. Loew
- albiventris, Först.

APHIDES

The work of identifying the insect pests of the county at the Technical Schools has necessitated a considerable amount of attention being given to the commoner aphides, and in 1901 and 1902 an attempt was made to collect and identify every species observed in the county. The efforts in this direction were not altogether successful, and it is probable that one or two of the species kept under observation for some time are not described in Buckton's *Monograph*. The peculiarities of the physiological processes involved make the study of the order very complicated, and the extensive morphological differences among members of the same species greatly increase the difficulties of identification. The parthenogenetic production of apterous young for few or many generations in succession, and for the most part of the female sex only; the occasional appearance of winged individuals, sometimes in considerable numbers; the frequent remarkable disproportion in numbers between the sexes when the males do appear; the occurrence of viviparous and oviparous broods; the difference of sex organs in the same sex and species; the extraordinary changes in life habits in successive generations and the consequent formation of so-called parallel series, are all so many difficulties in the way of accurate diagnosis. The following notes, however, deal only with those species about the identification of which there is no reasonable doubt.

Siphonophora rosae is, of course, ubiquitous. *S. granaria* in some years appears on wheat about Launceston, but is much more troublesome locally on grass than on grain. In 1901 *S. pisi* did considerable damage on garden peas about Bodmin. In 1902 almost every nettle in the neighbourhood of Truro carried a large colony of *S. urticae*. *S. dirhoda*, *S. lactucae*, *S. rubi*, and *S. rosarum* are at times abundant locally, while *S. jaceae* and *S. sonchi* are widely spread and common. *S. scabiosae* has been found plentifully near Falmouth, and *S. chelidonii* in the neighbourhood of Truro on bramble. *S. alliariae* was common in 1902 at Newquay on nipplewort. *S. fragariae* attacked the strawberries about Truro, Falmouth, and Penzance in 1900, and in places did considerable mischief. *S. hieracii* and *S. millefolii* seem to be rather local. *S. circumflexa* was found on *Ixia sparsa* and other Cape bulbs at Tresco, Scilly. *S. pelargonii* has been taken on various plants, but especially on shrubby calceolarias, at Truro. *S. carnosa* was plentiful at St. Clement, Truro, in 1902 on nettles, and appears to be widely spread. *S. longipennis* was fairly common in 1901 on *Poa annua* close to the Falmouth Docks. *S. convolvuli* has been taken at Miramar, Truro, on periwinkle and on various bindweeds. *S. avellanae* is widely distributed in the Truro district and elsewhere. *S. tanacetii* has been obtained on tansy in the Looe valley, and on feverfew in gardens about Truro. *S. artemisiae* occurs on mugwort about St. Ives. *S. solidaginis* was common in 1902 on golden-rod at Bishop's Wood, Truro, and on anthemis and groundsel at Millook. *S. tussilaginis* is occasionally

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very common locally on coltsfoot. *S. sisymbrii* is plentiful on hedge-mustard near Falmouth and at Marazion and on turnips at Kea. *S. olivata* has been taken in abundance on *Carduus lanceolatus* near Saltash and on *C. acaulis* in the west of the county.

Phorodon humuli, var. *mahaleb*, is not uncommon about Truro on the sloe, and has been found on the Czar plum. *P. galeopsidis* has been much in evidence lately in the middle of the county, especially on woundwort. It also occurs at Liskeard on *Lamium intermedium*, and in 1904 was disagreeably abundant at Truro on Chinese artichokes. *Myzus cerasi* occurs about Truro on black currant; at Bodmin last year it was unpleasantly common on cherry trees. *M. persicae* is widely distributed on peach and occasionally on apple trees. *M. ribis* is usually abundant, and causes the large reddish or brownish blotches on the leaves of the red currant. It is often common on gooseberry leaves. *Depranosiphon platanoides* is plentiful on sycamore and maple.

Rhopalosiphon ribis is abundant everywhere on the leaves of black currants, causing the formation of bright orange, reddish, and brown elevations, and making the leaves curl irregularly and so give shelter to hundreds of aphides. Occasionally it completely ruins the black-currant crop. At Bodmin it was fairly common in 1904 on ornamental currant. *R. lactucae* is not uncommon on sow-thistle and nipplewort, and in 1902 appeared at Mawgan-in-Pyder on *Hieracium aurantiacum*. *R. nymphaeae* occurs on water plantain at Newquay. *R. berberidis* has been taken at Truro somewhat sparingly on *Berberis vulgaris*, *B. darwinii*, and *Mahonia aquifolia*. *R. dianthi* did damage in 1904 to some of the early potatoes at Penzance; it has also been sent in several times on turnips and swedes, and last year attacked the foliage of the late tulips and of Mrs. Sinkins pink in the botanical garden at the Technical Schools, Truro. *Melanoxanthus salicis* has been repeatedly obtained from willows by the side of the Lynher. *Siphocoryne pastinacae* proved troublesome in 1905 on celery at Penzance, and in 1901 attacked parsley about Truro with disastrous results. *S. xylostei* is locally very common on honeysuckle in the St. Agnes district. *S. foeniculi* has been taken on garden fennel at Saltash and at Falmouth, and at Penryn quickly destroyed the foliage of a promising bed of carrots. *S. capreae* is widely spread on willows in the east of the county.

Aphis brassicae occasionally attacks cabbages and various cruciferous weeds in considerable numbers. In 1899 it caused great damage to the broccoli plants about St. Burian. The top leaves of the growing shoots of the whitethorn are frequently blistered and curled up into a tangled mass by the action of *A. crataegi*. *A. malvae* is a common greenhouse pest, which occasionally attacks various herbaceous plants in the open. *A. mali* sometimes causes great damage to the orchards of the county by destroying the foliage; in 1901 and 1902 it was very troublesome at Penzance, and in 1904 appeared in great numbers near Launceston and Callington. *A. urticae* is frequently seen on the bramble and the gooseberry as well as on nettles. In 1903 it proved troublesome in Truro on ornamental gourds. *A. pennicillata* has been noticed every year on willow herbs. Single cactus dahlias at Truro were in several cases last year attacked by *A. pyrarica*. *A. scabiosae* is generally distributed, but not usually common; it is a most varied feeder. *A. sorbi* is widespread but local, and occurs chiefly on mountain ash. *A. tanacetina* in 1904 appeared in numbers on a bed of Swan River daisy at Truro. *A. pruni* is in some years most destructive to the foliage of the apple, and in 1902 some of the trees in an orchard near Callington had almost every leaf rolled up regularly, lined inside with the characteristic sticky and mealy exudation, and literally filled with both winged and wingless forms of this species. Several of the plums were also severely attacked; at St. Columb a wall-peach was noticed in a similar condition, and at Truro *Pyrus japonica* was rendered unsightly. *A. hieracii* is widely spread on the leaves of hogweed. *A. petasitidis* occurs on the winter heliotrope, *Petasites fragrans* at Penwerris, Falmouth; and *A. lychnidis* locally on ivy. *A. hederæ* is common on ivy and is occasionally found on holly. The leaves and flowers of the guelder rose are at times attacked by *A. viburni*. *A. jacobæ* is often abundant on ragwort, groundsel, and *Senecio aquatica*; and *A. rumicis*, the 'collier' and 'black dolphin' of the gardener, is often conspicuous on broad beans, in some seasons has badly affected the turnip crop, and in 1901 it destroyed a field of mangels near Wadebridge; neglected docks and thistles often swarm with it. *A. laburni*, *A. papaveris*, *A. cardui*, *A. instabilis*, and *A. sambuci* all enter an appearance from time to time. *A. opima* is often common on neglected cinerarias, and *A. myosotidis* has been identified from several different plants. *A. amygdali*, in Cornwall as elsewhere, is the chief insect pest on peaches and nectarines, causing the leaves to curl and drop, and in bad cases completely stripping the branches. Occasionally these trees are attacked by *Hyalopterus pruni*, which produces characteristic white hoary masses under the leaves and gums them over with a glutinous secretion.

The singular dimorphic *Chaitophorus aceris* is not uncommon on sycamores and maples. *C. salicivorus* is apparently widespread, but local. *C. populi* is in some years unfortunately prevalent in the plum gardens, Truro. The birch-frequenting *Callipterus betularius* and *C. betulicola* have both been procured near Launceston, but are evidently scarce. *C. coryli* is generally distributed, but varies very greatly in numbers. *C. quercus* is local, but often abundant; at St. Germans it occurs on ilex.

INSECTS

The only aphid found on lime trees is *Pterocallis tiliae*, which is at times unpleasantly common. The frequent white silky or cottony mass under the leaves of the common beech is the secretion formed by a colony of *Phyllaphis fagi*. *Lachnus cupressi* was described by Buckton from specimens forwarded though McLachlan by the Hon. J. T. Boscawen from Lamorran, where they were doing considerable injury to the cypresses in 1879. *L. agilis* and *L. pini* have been taken sparingly near Truro on Scotch pine, and *L. pinicolus* on the same tree at North Hill. Aphides have been obtained several times in the nests of ants at Bishop's Wood, but by an accident the only species identified are *Trana troglodytes* and *Forda formicaria*.

The American blight, *Schizoneura lanigera*, is unfortunately ubiquitous, and the damage it does is too well known to require description. For several years the old elms in Tregoll's Road, Truro, have been infested by the leaf-blistering *S. ulmi* and the gall-producing *S. lanuginosa*. The former is the cause of the beautiful 'silver rain' that excited so much attention there in the summer of 1901.

The cotton-lined earth cavities of *Pemphigus fuscifrons* were common in a field of dredgecorn beside the Gannel in 1903, and *P. lactucarius* is often abundant at the roots of decaying garden lettuce. *Thelaxes dryophila* was very common on the oaks about Kilkhampston in April, 1900, but has not been collected since. *Chermes corticalis* frequently infests the twigs of the Scotch pine, and in the month of June the numerous white cottony tufts it forms at the base of the leaves are at times very conspicuous. The false cones on the spruce are the work of *C. abietis*; lately they have been somewhat scarce. *C. laricis*, too, is fortunately less common now than it was in 1891. *Phylloxera punctata* is abundant in some districts on the under surface of oak foliage. This and the scarcer *P. quercus* make bright yellow or orange spots right through the leaf. *P. vastatrix* is still fortunately very uncommon in the county, though numerous galls have twice been found on the leaves of greenhouse vines, and affected roots have thrice been sent for examination. *Tychea phaseoli* was obtained in considerable numbers near Truro in 1902 on the roots of haricot, lima and scarlet-runner beans.

ARACHNIDA

Spiders

The county of Cornwall ought, on account of its southern position and almost sub-tropical climate, to produce a very large number of spiders and other arachnids. There has, however, been very little serious collection done, and so far as I am aware, the Scilly Isles and northern shores have been entirely neglected. The present list is based upon the records made at different times by the Rev. O. Pickard-Cambridge, and on the many captures by Mr. G. C. Bignell, the well-known entomologist of Stonehouse, Plymouth. The remaining species have been observed and recorded by the present author during several visits to the county. Of the species (upwards of 500) recorded in Great Britain and Ireland, 117 only have been observed in this county, but the list might easily be doubled or trebled by a little energetic research.

Of the rarer or more interesting species one might mention *Atypus affinis*, which was taken in plenty along the south coast in June; *Micaria scintillans*; *Oxyptila sanctuaria*; *Euophrys petrensis*; *Lycosa perita*; *Meta Menardi*; *Araneus marmoreus*; *Erigone promiscua*; *Asagena phalerata*; *Teutana grossa*; *Enoplognatha thoracica*.

ARANEAE

MYGALOMORPHAE

ATYPIDAE

Spiders with eight eyes, four lung books, and three tarsal claws.

1. *Atypus affinis*, Eichwald.

Polperro; Fowey.

This example of the *Mygalomorphae*, though belonging to the same sub-order as the well-known trap-door spiders of the south of Europe and other tropical and sub-tropical regions, is distinguished from the *Arachnomorphae* by the possession of two pairs of pulmonary organs, or lung books, and by the vertical movement of the mandibles. These spiders make no

trap-door at all. The retreat consists of a long tunnel, half an inch in diameter and from 7 in. to 9 in. long, burrowed in the soil, and lined throughout with white silk, terminating at the lower end in a slightly enlarged cell, where the egg-sac is formed and the young are hatched, and tended by the female. The upper end of the silk lining is prolonged for about 3 in. beyond the extremity of the burrow, forming a loose tube, closed at the end, and either lying on the surface of the soil, woven amongst the roots of heather and herbage, or hanging down free, according to the nature of the surroundings. Mr. Enock

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reports that the spider does not leave this retreat in search of prey, but waits in the slack portion of the tube lying outside the burrow until some insect sets foot upon this silken, purse-like structure. Instantly the fangs of the spider's mandibles are stuck through the walls of the tube, the insect seized and dropped into the burrow through a rent in the silk, which is afterwards mended from within. The male is smaller,

almost black, and may sometimes be found moving slowly about in the sunshine in the neighbourhood of the colony. The species occurs all along the coast from Hastings to the Land's End, and in various localities inland. On the Cornish coast I have found it on the downs close to the edge of the cliffs under stones. The spider has also been recorded under the names *A. sulzeri* and *A. piceus* by English authors.

DYSDERIDAE

Spiders with six eyes and two pairs of stigmatic openings, situated close together on the genital rima; the anterior pair communicating with lung books, the posterior with tracheal tubes. Tarsal claws, two in *Dysdera*, three in *Harpactes* and *Segestria*.

2. *Dysdera cambridgii*, Thorell.

Saltash (G. C. B.).

Not uncommon under stones and bark of trees, where it lurks within a tubular retreat. The spider is easily recognizable by its elongate form, orange legs, dark mahogany carapace, and pale clay yellow abdomen. The palpal bulb of the male has no cross-piece at the apex. The spider is also known as *D. erythrina*, Blackwall.

3. *Dysdera crocata*, C. L. Koch.

Gerrans Bay.

Larger than the last species, with a deep orange-pink carapace, orange legs, and abdomen with a delicate rose-pink flush. The palpal bulb of the male

has a cross-piece at the apex. This spider is also known as *D. rubicunda*, Blackwall.

4. *Harpactes hombergii*, Scopoli.

Whitsand Bay (G. C. B.).

Rare under bark of trees, and recognizable by its linear ant-like form, black carapace, and pale clay yellow abdomen and three tarsal claws.

5. *Segestria senoculata*, Linnaeus.

Polperro.

Not common; under bark of trees, in the crevices of loose stone walls and amongst detached rocks. Recognized by its linear form and black diamond-shaped blotches on the dorsal surface of the abdomen.

6. *Oonops pulcher*, Templeton.

Liskeard.

Rare; a very small linear brick-red spider, often found on the walls of bedrooms, as well as beneath stones.

DRASSIDAE

Spiders with eight eyes, situated in two transverse rows. The tracheal openings lie just in front of the spinners. The tarsal claws are two in number, the anterior pair of spinners are set wide apart at the base, and the maxillae are more or less impressed across the middle.

7. *Drassodes lapidosus*, Walckenaer.

Polperro; Looe; Liskeard.

Very common under stones. Also known as *Drassus lapidicolens*.

8. *Scotophaeus blackwallii*, Thorell.

Liskeard.

A dark elongate mouse-grey spider, often found wandering about the walls of dwelling- and out-houses at night. Known also as *Drassus sericeus*, Blackwall.

9. *Prosthesima petiverii*, Scopoli.

Downderry Cliffs (G. C. B.).

10. *Prosthesima pedestris*, C. L. Koch.

Whitsand Bay; Downderry Cliffs (G. C. B.); Polperro.

11. *Micaria pulicaria*, Sundevall.

Mawnan, Polperro.

A brilliant little spider with iridescent scales on its body. Not uncommon running about in the hot sunshine. Known also as *Drassus nitens* and *Drassus micans*, Blackwall.

12. *Micaria scintillans*, O. P.-Cambridge.

Downderry Cliffs (G. C. B.).

A much rarer and rather larger species found beneath stones or running about in the hot sunshine. A male and two females were taken by Mr. Bignell in May.

13. *Micariosoma festivum*, C. L. Koch.

Liskeard.

Very similar in general appearance to those of the last genus, but smaller and more ant-like. Known also as *Phrurolithus festivus* and *Drassus propinquus*, Blackwall.

CLUBIONIDAE

Spiders with eight eyes, situated in two transverse rows. The tracheal openings lie immediately in front of the spinners. The tarsal claws are two in number, but the anterior pair of spinners are set close together at the base; the maxillae are convex and not impressed across the middle.

14. *Lycodia spinimana*, Sundevall.

Gerrans Bay.

Known also as *Zora* and *Hecarge spinimana* or *maculata*.

15. *Clubiona stagnatilis*, Kulczynski.

Looe.

Known also as *C. holosericea*, Blackwall.

The species is usually fairly common amongst the dry sedge grass and rushes in swampy places.

16. *Clubiona terrestris*, Westring.

Liskeard.

Not uncommon in the summer time, when it may be found wandering about at night on the walls of outhouses, palings, etc. Known also as *C. amarantha*, Blackwall.

17. *Clubiona reclusa*, O.P.-Cambridge.

Liskeard.

A rarer species than the last; usually beaten from foliage and bushes in the summer time.

18. *Clubiona lutescens*, Westring.

Liskeard.

Rare; but sometimes fairly abundant where it occurs amongst dry rushes and sedge grass in swampy places.

19. *Clubiona brevipes*, Blackwall.

Liskeard.

Not uncommon amongst foliage in the summer time.

20. *Clubiona pallidula*, Clerck.

Liskeard.

A larger species than any of the above, and usually fairly common amongst bramble bushes, and where the female makes its egg-cocoon within the folded leaves. Known also as *C. epimelas*, Blackwall.

21. *Clubiona phragmitis*, C. L. Koch.

Liskeard.

Very common indeed amongst rushes and dry sedge grass in swamps, where the females construct a pure white silken retreat amongst the blades or under the bark of riverside palings, posts, pollard, willow trees, &c. Known also as *C. deinognatha*, O. P.-Cambridge.

22. *Clubiona compta*, C. L. Koch.

Mawnan.

A very small species, whose abdomen is striped diagonally on each side, similarly to that of *C. corticalis*, Walckenaer. Not uncommon amongst the foliage of bushes and shrubs in the summer time.

23. *Chiracanthium erraticum*, Walckenaer.

Mawnan.

Sometimes very common in the folded leaves of the various species of bramble in the summer time. The spider resembles a '*Clubiona*,' but has longer legs and a red stripe down the abdomen. Known also as *Chiracanthium carnifex* (Fabricius).

24. *Liocranum rupicolum*, Walckenaer.

Polperro.

Not uncommon under rocks and stones. Known also as *Liocranum domesticum* (Wider), and *Clubiona domestica*, Blackwall.

25. *Agroeca brunnea*, Blackwall.

Gerrans Bay.

Rarely found amongst dead leaves and at the roots of herbage in woods. Known also as *Agelena brunnea*.

ANYPHAENIDAE

26. *Anyphaena accentuata*, Walckenaer.

Liskeard.

Often common on the foliage of oak and other trees. This spider is remarkable for the position of

the spiracular opening, which lies in the middle of the ventral surface of the abdomen between the genital rima and the spinners, and not, as in the last family, immediately in front of the spinners. Known also under *Clubiona*.

THOMISIDAE

Spiders with eight eyes, situated in two transverse rows, two tarsal claws, and anterior spinners close together at their base. Maxillae not impressed. The crab-like shape and sidelong movements of these spiders are their chief characteristics, enabling them to be easily distinguished, as a rule, from the more elongate *Drassidae* and *Clubionidae*.

27. *Philodromus dispar*, Walckenaer.

Mawnan.

This spider with its shiny black abdomen, is not uncommon in the summer time amongst foliage, and can sometimes be observed crouching flat upon palings. It is very swift in its movements.

28. *Misumena vatia*, Clerck.

Mawnan.

This species, one of the largest of the *Thomisidae*, can be found in the blossoms of various woodland plants, where it crouches amongst the petals on the

watch for its prey. The colour of the female is yellow, with red lateral slashes; the male being much smaller and almost black. Known also as *Thomisus citreus*, Blackwall.

29. *Diaea dorsata*, Fabricius.

Whitsand Bay (G. C. B.).

A bright green spider with a large dull red-brown central patch on the abdomen; not uncommon on herbage and amongst flowers. Known also as *Thomisus floricolens*, Blackwall.

30. *Philodromus aureolus*, Clerck.

Mawnan.

A very abundant species, with usually a dull red-brown abdomen, with yellowish central pattern. It frequents the foliage of trees of all kinds, and especially in the immature condition will outnumber all other species which fall into the umbrella beneath the beating-stick.

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31. *Philodromus caespiticolis*, Walckenaer.

Liskeard.

This species is possibly only a variety of the last-named, and frequents similar situations. Known also as *P. caespiticolens*, Blackwall.

32. *Tibellus oblongus*, Walckenaer.

Falmouth.

A long, very narrow, dull white or straw-coloured spider, often common amongst dry grass in many different localities. It attains, however, its largest size amongst the sedge grass and rushes in swamps and bogs. The elongate form assists in their concealment from foes as the spiders lie close to the pale rush stems and slender dry blades. Known also as *Philodromus* or *Thanatus oblongus*.

33. *Xysticus cristatus*, Clerck.

Liskeard ; Polperro.

This is by far the commonest of the 'crab-spiders,'

and is found abundantly on foliage or crouching on bare places in fields and commons. Known also under *Thomisus*.

34. *Xysticus erraticus*, Blackwall.

Falmouth.

A larger species than the last, having, instead of a narrow wedge-shaped dark central bar on the carapace, a broad spade-shaped dull red band margined with white. Known also as *Thomisus erraticus*.

35. *Oxyptila blackwallii*, Simon.

Polperro.

Known also as *Thomisus claveatus*, Blackwall.

36. *Oxyptila sanctuaria*, O. P.-Cambridge.

Penzance (O. P.-C.) ; Whitsand Bay (G. C. B.).

A very rare little species.

SALTICIDAE

The spiders of this family may be recognized in a general way by their mode of progression, consisting of a series of leaps, often many times their own length. More particularly they may be known by the square shape of the cephalic region and the fact that the eyes are arranged in three rows of 4, 2, 2 ; the centrals of the anterior row being much the largest and usually iridescent. Those of the second row are the smallest, while the posterior pair is placed well back and helps to give the quadrate character to the carapace. Otherwise these spiders are simply specialized *Clubionids* with two tarsal claws and other minor characters possessed in common with members of this latter family. They can be beaten from foliage or found amongst herbage and under stones. The commonest, *Salticus scenicus*, will be known to all observers, running and leaping on the walls of houses in the bright sunshine.

37. *Salticus scenicus*, Clerck.

Downerry (G. C. B.) ; Mawnan.

A black species with white lateral stripes. Known also as *Epiblemum scenicum*.

38. *Euophrys erraticus*, Walckenaer.

Liskeard ; Falmouth.

Not rare on stone walls under the coping stones in the summer.

39. *Euophrys frontalis*, Walckenaer.

Downerry Cliffs (G. C. B.).

Known also as *Salticus frontalis*.

40. *Euophrys petrensis*, C. L. Koch.

Treganthe (G. C. B.).

A very minute little salticid with brilliant red hairs over the eyes. Known also as *Salticus coccociliatus*, O. P.-Cambridge.

41. *Attus pubescens*, Fabricius.

Gerrans Bay.

Known also as *Salticus sparsus*, Blackwall.

42. *Heliophanus cupreus*, Walckenaer.

Treganthe (G. C. B.) ; Polperro.

Known also as *Salticus cupreus*.

43. *Heliophanus flavipes*, C. L. Koch.

Mawnan ; Polperro.

44. *Ergane falcata*, Clerck.

Mawnan.

Not uncommon on bushes in the summer months. Known also as *Hasarius falcatus* and *Salticus coronatus*, Walckenaer.

PISAURIDAE

Spiders with eight eyes in three rows of 4, 2, 2 ; the small anterior eyes being sometimes in a straight line, sometimes recurved, and sometimes procurved. Those of the other two rows are situated in the form of a rectangle of different proportions, and are much larger than the eyes of the anterior row. The tarsal claws are three in number. *Pisaura* runs freely over

the herbage, carrying its egg-sac beneath the sternum ; while *Dolomedes* is a dweller in marshes and swamps.

45. *Pisaura mirabilis*, Clerck.

Mawnan ; Liskeard.

Known also as *Dolomedes* or *Ocyale mirabilis*.

LYCOSIDAE

The members of this family are to be found running freely over the ground, and carrying the egg-sac attached to the spinners. Many of the larger species make a short burrow in the soil and there keep guard over the egg-sac. Eyes and tarsal claws as in *Pisauridae* with slight differences.

46. *Lycosa ruficola*, De Geer.

Whitsand Cliffs (G. C. B.) ; Gerrans Bay ; Polperro.

Very similar to the next species, but the male has a claw on the palpus and the female a much smaller

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vulva. Known also under *Trochosa* and as *Lycosa campestris*, Blackwall.

47. *Lycosa terricola*, Thorell.

Whitsand Cliffs (G. C. B.); Gerrans Bay; Liskeard.

Known also as *L. agretica*, Blackwall, and under *Trochosa*.

48. *Lycosa pulverulenta*, Clerck.

Liskeard; Mawnan.

Known also as *Lycosa rapax*, Blackwall, and under the genus *Tarentula*.

49. *Lycosa perita*, Latreille.

Whitsand Bay (G. C. B.).

A very beautiful species, usually frequenting sandy places, its colours assimilating admirably with its surroundings. It constructs a shallow burrow in the sands sometimes having a narrow lid-like roof over the entrance. Known also as *Lycosa picta*.

50. *Pardosa nigriceps*, Thorell.

Liskeard; Downterry Cliffs (G. C. B.).

Occurs not uncommonly in the moorland districts of Cornwall.

51. *Pardosa lugubris*, Walckenaer.

Mawnan.

A very abundant spider in the spring, running rapidly over the dead leaves in the woods. Known also under *Lycosa*.

52. *Pardosa pullata*, Clerck.

Downterry Cliffs (G. C. B.).

Known also under *Lycosa* and *L. obscura*, Blackwall.

53. *Pardosa palustris*, Linnaeus.

Mawnan.

Known also under *Lycosa* and as *L. exigua*, Blackwall (in part).

54. *Pardosa amentata*, Clerck.

Mawnan; Liskeard.

Very abundant on logs of wood or hatchways, in meadows and by the riverside; also in gardens. One of our largest *Pardosas*. Known also under *Lycosa* and as *L. saccata*, Blackwall.

55. *Pardosa annulata*, Thorell.

Polperro.

Somewhat similar to but smaller than the last-named species. Known also under *Lycosa*.

56. *Pirata piraticus*, Clerck.

Falmouth.

Common in marshy places, carrying its pure white egg-sac on the spinners. Known also as *Lycosa piratica*.

57. *Pirata latitans*, Blackwall.

Falmouth.

A smaller species, but commoner than the last. Known also as *Lycosa latitans*.

AGELENIDAE

Spiders with eight eyes, situated in two transverse rows. Legs with three tarsal claws. The species of this family spin a large sheet-like web, and construct a tubular retreat at the back of it, which leads to some crevice amongst the rocks or the herbage or the chinks in the walls of outhouses, wherever the various species may happen to be found. The posterior pair of spinners is usually much longer than the other two pairs.

58. *Tegenaria atrica*, C. L. Koch.

Portscatho.

A very large spider with long legs, not uncommon in cellars and outhouses, and also in holes, in banks, &c.

59. *Tegenaria derhamii*, Scopoli.

Portscatho.

A smaller, paler, and more common species than the last-named. Almost entirely confined to houses. Known also as *T. civilis*.

Tegenaria silvestris, C. L. Koch.

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A still smaller species, sometimes not uncommon

amongst rockeries in greenhouses and gardens. Known also as *T. campestris*.

61. *Textrix denticulata*, Olivier.

Looe.

A common and swiftly-moving spider found under the rocks and stones on the undercliffs. It may be recognized by the red, or sometimes almost white, dentate band on the abdomen. Known also as *Textrix lycosina*, Sundevall.

62. *Agelena labyrinthica*, Clerck.

Mawnan; Liskeard.

A common spider, large when full-grown, spinning a huge sheet-like white web over the herbage, with a funnel-shaped tubular retreat. Like others of the family the posterior pair of spinners is formed of two distinct segments.

63. *Hahnina montana*, Blackwall.

Polperro; Mawnan.

Known also as *Agelena montana*.

ARGYOPIDAE

The spiders included in this family have eight eyes, situated in two rows, the lateral eyes of both rows being usually adjacent, if not in actual contact, while the central eyes form a quadrangle. The tarsal claws are three, often with other supernumerary claws. The web is either an orbicular snare, or consists of a sheet of webbing, beneath which the spiders hang and capture the prey as it falls upon the sheet. This

immense family includes those usually separated under the names of *Eperidae* and *Linyphiidae*.

64. *Meta segmentata*, Clerck.

Mawnan; Liskeard.

A very abundant spider in the summer and autumn amongst nettles and other herbage along hedgerows. The spiders vary very much in size and spin an

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orbicular web, having a clear space in the centre as do others of the genus, and also *Tetragnatha*, thus differing from the genus *Araneus* (*Epeira*). Known also as *Epeira inclinata*, Blackwall.

65. *Meta menardi*, Latreille.

Saltash (G. C. B.).

A fine species, found usually in caves. Known also as *Epeira fusca*, Blackwall.

66. *Meta merianae*, Scopoli.

Portscatho.

A large species found in cellars and damp places. Known also as *Epeira antriada*, Blackwall, and a variety with a white band down the centre of the abdomen as *E. celata*, Blackwall.

67. *Tetragnatha extensa*, Linnaeus.

Mawnan.

A very common species of elongate form which sits in the centre of its web with legs stretched out in front and behind. Not so entirely confined to marshy localities as the next species, and easily recognized by the silvery white bands under the abdomen. The jaws in the males of this genus are very large and conspicuous.

68. *Tetragnatha solandri*, Scopoli.

Falmouth.

Very similar to the last species in general appearance, but almost entirely confined to river banks and marshy swamps. Can be recognized by the dull white bands beneath the abdomen, and the absence of any pale line on the sternum.

69. *Pachygnatha clerckii*, Sundevall.

Gerrans Bay.

Resembles a *Tetragnatha* in the possession of very large mandibles, but is not elongate and spins no web to speak of. Found under leaves and at the roots of herbage, especially in marshy places.

70. *Pachygnatha degeerii*, Sundevall.

Whitsand Bay (G. C. B.); Gerrans Bay.

Smaller and commoner than the last species. Found at the roots of herbage.

71. *Cyclosa conica*, Pallas.

Mawnan.

A rare but easily recognized species, having a triangular abdomen, and sits in the centre of its web on a band of white transparent silk; possibly from a distance appearing like the dung of a small bird upon the surrounding foliage. Known also under *Epeira*.

72. *Zilla X-notata*, Clerck.

Portscatho.

A very common spider, usually spinning its web on or in the proximity of buildings. The web has a vacant wedge-shaped piece with a single free ray from the centre. Known also as *Epeira similis*, Blackwall.

73. *Zilla atrica*, C. L. Koch.

Mawnan.

Almost as common as the above, but more usually confined to the foliage of trees and bushes. The males have a very long palpus, while in *X-notata* these are very short. Known also as *Epeira callophylla*, Blackwall.

74. *Araneus cucurbitinus*, Clerck.

Mawnan.

A beautiful green spider with bright red tips to the tail end, rendering it like the bud of a flower. Known also under *Epeira*.

75. *Araneus diadematus*, Clerck.

Gerrans Bay ; Liskeard.

By far the commonest of our spiders, being known as the 'garden spider,' of large size, usually red-brown with lozenge-shaped spots, spinning an orb-web. Known also under *Epeira*.

76. *Araneus quadratus*, Clerck.

Gerrans Bay.

A common spider in October on most heathy commons, where it spins a strong orb-web, and makes a tent for concealment under the heather or gorse. Its food consists chiefly of the common honey-bee, and in colour it is warm pink with green shading and four large white spots on the back of the abdomen. Known also under *Epeira*.

77. *Araneus marmoreus*, Clerck.

Botus Fleming (G. C. B.).

Known also as *Epeira marmorea* and *Epeira scalaris*, and *Epeira pyramidata* (Clerck).

78. *Araneus adiantus*, Walckenaer.

Whitsand Bay (G. C. B.).

Usually fairly common amongst the long grass growing on the undercliffs all along the south coast. Known also as *Epeira adianta*.

79. *Araneus cornutus*, Clerck.

Gerrans Bay.

Abundant in rush beds, &c. near streams or in swampy places. Known also as *Epeira apoclista*, Blackwall.

80. *Araneus umbraticus*, Clerck.

Liskeard ; Mawnan.

A large species, very like the last in general appearance, but much more flattened, for it lives under the bank of trees and posts, spinning a strong orb-web, and venturing out of its lurking place only at night-fall. Known also under *Epeira*.

81. *Araneus triguttatus*, Fabricius.

Mawnan.

Not uncommon on iron palings, where the rust-red patch on the forepart of the abdomen resembles a spot of iron-rust, and thus favours concealment. It can also be beaten from the foliage of trees. Known also under *Epeira agalena*.

82. *Porrhomma inerrans*, O. P.-Cambridge.

Mawnan.

Known also as *Nerienne inerrans*.

83. *Linyphia triangularis*, Clerck.

Liskeard.

A very abundant species in autumn, whose sheet-like snares glistening with dewdrops form a conspicuous feature on the hedges and bushes in the early mornings. The mandibles in the male are very long, resembling those in *Tetragnatha*.

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84. *Linyphia pusilla*, Sundevall.
Mawnan.

A smaller species than the last, with deep black ventral region. The palpus in the male sex has a long spiral spine. It spins its web near the ground amongst herbage. Known also under *L. fuliginea*, Blackwall.

85. *Linyphia montana*, Clerck.
Liskeard.

A large species, whose habits are similar to those of *triangularis*. It is, however, often found in conservatories and outhouses. Known also as *L. marginata*, Blackwall.

86. *Linyphia hortensis*, Sundevall.
Liskeard ; Mawnan.

Not a common species, somewhat similar to *pusilla* in general appearance and habits. Known also as *L. pratensis*, Blackwall.

87. *Linyphia clathrata*, Sundevall.
Gerrans Bay.

Resembles *montana*, but is smaller. Very common amongst herbage. Known also as *Neriere marginata*, Blackwall.

88. *Linyphia peltata*, Wider.
Liskeard ; Mawnan.

A very small and common species found amongst the foliage of trees and bushes in the summer time. A variety is known also as *L. rubea*, Blackwall.

89. *Labulla thoracica*, Wider.
Liskeard ; Portscatho.

Not uncommon in outhouses or under overhanging banks and rocks. The male is remarkable for the enormously long spiral spine on the palpal bulb.

90. *Stemonyphantes lineatus*, Linnaeus.
Polperro.

Known also as *Linyphia bucculenta*, O. P.-C. ; and *Neriere trilineata*, Blackwall.

91. *Lepthyphantes leprosus*, Ohlert.
Mawnan ; Portscatho.

A very common species in stables, haylofts, and outhouses. Known also under *Linyphia*.

92. *Lepthyphantes blackwalli*, Kulczynski.
Gerrans Bay.

Often very common at the roots of herbage in September. Known also as *Linyphia tenebricola* (Wider), O. P.-C. and *L. terricola*, O. P.-C. and Blackwall.

93. *Lepthyphantes tenuis*, Blackwall.
Mawnan.

Very similar to the last species, and found under the same conditions. Known also as *Linyphia tenebricola*, O. P.-C.

94. *Lepthyphantes minutus*, Blackwall.
Liskeard.

Known also under *Linyphia*.

95. *Bathyphantes nigrinus*, Westring.
Falmouth.

Known also as *Linyphia pulla*, Blackwall, and also under *Linyphia*. Common in marshes and swamps.

96. *Bathyphantes concolor*, Wider.
Liskeard ; Portscatho.

Known also as *Theridion filipes*, Blackwall, and under *Linyphia*.

97. *Bathyphantes gracilis*, Blackwall.
Polperro ; Liskeard.

Known also under *Linyphia*.

98. *Bathyphantes dorsalis*, Wider.
Liskeard ; Mawnan.

Common on the foliage of trees and bushes in the summer time. Known also under *Linyphia* and as *L. claytoniae*, Blackwall.

99. *Poecilometes variegata*, Blackwall.
Portscatho.

Known also under *Linyphia* and *Neriere*.

100. *Erigone atra*, Blackwall.
Liskeard.

Known also under *Neriere*. Often abundant on railways.

101. *Erigone promiscua*, O. P.-Cambridge.
Mawnan.

Known also as *Neriere promiscua*.

102. *Gonatium rubens*, Blackwall.
Liskeard.

Known also under *Neriere*.

103. *Gonatium isabellinum*, C. L. Koch.
Portscatho.

Known also as *Neriere rubella*, Blackwall.

THERIDIIDAE

The members of this family have eight eyes situated very much like those of the *Argyropidae*, but the mandibles are usually weak, the maxillae are inclined over the labium, and the posterior legs have a comb of stiff curved spines beneath the tarsi. The web consists of a tangle of crossing lines, and the spider often constructs a tent-like retreat where the egg-sac is hung up.

104. *Steatoda bimaculata*, Linnaeus.
Downderry Cliffs (G. C. B.).

Known also as *Theridion carolinum*, Blackwall, and *Theridion bimaculatum*.

105. *Steatoda tepidariorum*, C. L. Koch.
Mawnan.

This large species is one of our commonest spiders in conservatories and greenhouses, where the curious triangular-shaped female may be seen hanging with legs closely gathered to the body in the middle of the tangled web. Sometimes, but not often, a few chips of dry leaf fallen into the web may be utilized as a sort of apology for a tent-like retreat, constructed in the case of *T. formosum* with such elaborate skill. When prey of any kind falls into the toils the spider

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hurries down, and with the tarsal comb on the fourth pair of legs commences kicking out from the spinners silken fluid, often quite moist like treacle, which strikes against and hardens on the victim. In this way very large spiders, beetles, and wood-lice are ensnared and converted into food. With a rapid and irritable movement of the forelegs also, small tufts of fine silk are gathered and flung promiscuously over the web. The male, a much smaller spider, may often also be seen hanging near at hand in the web, and the one or more brown pear-shaped egg-sacs also hang in the upper part of the toil. Sometimes these spiders are found outside the houses, but rarely, if ever, amongst the shrubs in the open garden. Known also under *Theridion*.

106. *Steatoda varians*, Hahn.

Mawnan.

A very much smaller species, varying considerably in colour, and found abundantly in greenhouses and also amongst shrubs in the open garden. This species makes no tent-like retreat, but sits close to the one or more pale rounded egg-sacs, usually spun up against a beam or window-sill. Known also under *Theridion*.

107. *Steatoda denticulata*, Walckenaer.

Mawnan.

Also a very small and abundant species, occurring on the outside of windows and outhouses, also on walls and palings. It makes no tent-like retreat, and the habits are very similar to those of the last species. Known also under *Theridion*.

108. *Steatoda sisypium*, Clerck.

Liskeard.

Very common on gorse and holly bushes, where they construct a tent-like domicile, and spin up within its shelter the small greenish egg-sacs. The young when hatched pass also their earlier days within the tent, but on the death of the mother spider they scatter, taking up positions for themselves amongst the neighbouring foliage. Known also as *Theridion nervosum*, Blackwall, and under *Theridion*.

109. *Steatoda pallens*, Blackwall.

Saltash (G. C. B.) ; Liskeard.

This minute *Theridioid*, pale yellow in colour, with often a dark, or paler dorsal spot on the abdomen, lives beneath the leaves of shrubs and trees—laurel,

elm, lime, etc.—where it spins its minute pear-shaped pure white egg-sac, which rests on its larger end and has several other small cusps towards the small sharp-pointed stalk. Known also under *Theridion*.

110. *Theridion ovatum*, Clerck.

Mawnan.

A very common species. The female lives in the folded leaf of a bramble, or that of some other shrub, spinning the edges together. Within this domicile she constructs a round sea-green egg-sac about as large as a very small pea. The spider has a pale yellow abdomen with a broad pink central dorsal band or two pink bands, one on each side. Another variety has no pink bands, but a row of black spots on each side. The male and female can often be found together within their leafy domicile. This spider is also known under the name of *Phyllonethis lineata* and *Theridion lineatum*.

111. *Steatoda bipunctata*, Linnaeus.

Mawnan ; Portscatho.

A dark brown, shiny, rather flattened spider living in chinks of walls, angles of windows, and crevices in the partitions of old stables, etc. emerging usually at nightfall. The males are remarkable for their very large palpi and also for the possession of a stridulating organ, formed by a series of chitinous ridges in a hollow at the anterior part of the abdomen, which move over some cusps on the conical posterior of the carapace. Known also as *Theridion quadripunctatum*, Blackwall, and *Steatoda bipunctata*.

112. *Asagena phalerata*, Panzer.

Downderry Cliffs (G. C. B.).

A rare species. Known also as *Theridion signatum*, Blackwall.

113. *Enoplognatha thoracica*, Hahn.

Mawnan.

Known also as *Neriere albipunctata*, O. P.-Cambridge, and *Drepanodus obscurus*, O. P.-Cambridge.

114. *Teutana grossa*, C. L. Koch.

Portscatho.

A rare species, found usually in cellars or caves. A single adult male. Known also as *Theridion versutum*, Blackwall, and *Steatoda versuta*.

PHOLCIDAE

Spiders with more or less slender bodies and very long slender legs. The eyes are situated in three groups—a group of two in the centre, and a group of three on each side. The only British species we possess is a well-known frequenter of houses in the southern counties, spinning an irregular web and

moving swiftly with a circular shaking motion when alarmed.

115. *Pholcus phalangioides*, Fuesslin.

Botus Fleming ; Cothele ; Saltash (G. C. Big-nell).

DICTYNIDAE

The spiders belonging to this family possess three tarsal claws, and the eyes are eight in number, situated in two transverse rows, the laterals being in contact. The cribellum (or extra pair of spinning organs) and the calamistrum (a row of curving bristles on the pro-

tarsi of the fourth pair of legs) are present in all members of the family. They construct a tubular retreat with an outer sheeting of webbing, which is covered with a flocculent silk made with the calamistrum by threads from the cribellum.

SPIDERS

116. *Amaurobius similis*, Blackwall.

Mawnan ; Portscatho.

A very common species in greenhouses, stables, and other outhouses. The males may often be found wandering about the walls of dwelling-houses after nightfall. Known also under the name *Ciniflo*.

117. *Amaurobius ferox*, Walckenaer.

Whitsand Cliffs (G. C. B.) ; Liskeard ; Portscatho.

A much larger species, shiny black with pale markings, found in cellars and also beneath rocks and stones on the coast, or in crevices of banks in the open country. Known also under the name *Ciniflo*.

CHERNETES

CHELIFERIDAE

Out of twenty species of false-scorpions indigenous to Great Britain only one is recorded from this county. The various species can be found amongst moss and dead leaves, or beneath stones and the bark of trees. They are unmistakeable on account of their possession of a pair of forcipated palpi, like those of the true scorpion. These are usually extended wide

open when the Arachnid is alarmed, while it hastens backwards to take shelter. In spite of this scorpion-like appearance these little creatures are much more nearly allied to the mites or *Acaridea*.

118. *Chthonius rayi*, C. L. Koch.

Whitsand Bay (G. C. Bignell).

OPILIONES

The Harvestmen are spider-like creatures with eight long legs, the tarsi long and very flexible. Eyes simple, two in number, situated on each side of an eye-eminence. Body not divided into two distinctive

regions by a narrow pedicle, as in the spider's. Abdomen segmentate ; breathing apparatus consisting of tracheal tubes with external stigmata.

TROGULIDAE

119. *Anelasmacephalus cambridgii*, Westwood. (O.P.-Cambridge). Known also as *Trogulus cambridgii*.

CRUSTACEANS

The county of Cornwall has for its size far more coast-line than any other English county, and that coast-line is strongly indented. It juts into the ocean further to the west and further to the south than any other part of Great Britain. It has a northern as well as a southern aspect. Harbours great and small receive vessels of every description arriving from far and near. Its interior is diversified. The margin between tide-marks is very far from uniform in character. The sea outside is variable in depth, and contains numerous islands which are reckoned as part of the county. From all these circumstances combined those who understand the habits of crustaceans would expect Cornwall in this branch of its fauna to compare favourably with any other equal area in the kingdom. That it does in fact respond to this presumption has been proved by the marine researches of several enthusiastic observers. Jonathan Couch, the famous surgeon of Polperro, set a distinguished example, which was excellently followed by his son Richard Quiller Couch of Penzance, by his disciple and helper William Laughrin, A.L.S., the Polperro coastguardsman, by W. P. Cocks, Esq., assiduous in recording the fauna of Falmouth, and quite recently by my friend Mr. Rupert Valentin, F.L.S., who has found time for home work as well as exploring the far-off waters of the Falkland Islands. To the results obtained by residents, important additions have been made by visitors, such as Canon Norman, F.R.S., Dr. G. S. Brady, F.R.S., and David Robertson, D.C.L., 'the naturalist of Cumbrae.' One who was neither exactly a resident nor exactly a visitor must also certainly be mentioned. Spence Bate was a dental surgeon long in practice in Plymouth, whence he was able to make natural history excursions as readily in this his native county as in the one of his adoption, and in discussing the crustacea of Plymouth Sound he recognizes that at least in those waters there is a faunistic partnership between Cornwall and Devon. In response to an invitation from the Royal Institution of Cornwall he published in 1878 'The Crustacea of Couch's Cornish Fauna, revised and added to by C. Spence Bate, F.R.S.'¹ Considering the high reputation he had won by his numerous writings and his really extensive knowledge in this department of study, the task involved in this revision must have seemed to all concerned both appropriately placed and easy of performance. It fell, however, upon a time when no doubt Mr. Bate was extremely pressed by other engagements. The twenty-five years, however, which have elapsed since Bate's essay appeared, have been fruitful in exact studies of the crustacean class carried out by men of distinction. It is far less excusable, therefore, now than then to be in the wrong; but on the other hand it is far less easy to explain, or even indicate briefly and concisely, all that is known of an enlarged and expanded science.

A paradox meets the beginner in the fact that multitudes of Crustacea are not crustaceous. The external chitinous skeleton so essential for providing the muscles with points of attachment may be hardened by deposits of lime to the consistence of stone earthenware, or from the brittleness of delicate china it may pass through conditions of membranous and papyraceous flexibility. The mode of life, too, has acted vigorously upon the outward form and general appearance. Aquatic species as compared with terrestrial, marine with freshwater, the parasitic and the independent, such as swim or walk in contrast with others that are fixed to a rock or any object from which they cannot detach themselves, may well be expected to differ. But the amount of difference often goes a good way beyond expectation. Sometimes, to be sure, it falls a little short of it. But at all events no one without instruction, without using knowledge laboriously and gradually accumulated in the past, could tell that the Malacostraca, Entomostraca, and Thyrostraca—that is to say, crabs and shrimps and wood-lice, water-fleas and fish-lice and barnacles—all alike rightfully belong to the crustacean class of the animal kingdom.

The first of these three divisions is also popularly the best known. Of the English species belonging to it a large number have been observed in this county. All the principal sub-divisions will have to be included in our survey, the Decapoda (brachyurous and macrurous), Schizopoda, Stomatopoda, Sympoda, Isopoda, and Amphipoda, all named from the number, structure, or position of the trunk-legs. These sub-divisions embrace the crabs, hermits, lobsters, crayfish, prawns, shrimps, wood-lice, scuds, and sandhoppers, with various other kinds of which common parlance has hitherto

¹ *Journ. Roy. Inst. of Cornw.* part ii, No. xix, pp. 1-74. It will be convenient to quote this work as 'Revision.'

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taken no particular heed. Such vernacular names as some of them enjoy are local, divergent, no easier to understand than their scientific equivalents. The singular bond which unites these diversified groups is a limitation in the number of body segments, and this limitation needs a little explaining. There is a controversial first segment which sometimes carries a pair of eyes on movable stalks. There is a controversial twenty-first segment called the telson, which carries no independent appendages. But between or apart from these two terminals there are nineteen, and never more than nineteen, appendage-bearing segments traceable throughout all the Malacostraca.¹ It must be well understood that though the number is never exceeded, neither is it in practice ever distinctly attained. Always some of these pieces of the body's framework are soldered together, so as not to be separately movable. Occasionally a segment is altogether lost and its appendages have vanished. Hence this numerical relation, systematically so important, cannot be regarded as a first aid to the uninstructed. It binds the malacostracan sub-class into a united whole. Some of the features which distinguish the subordinate groups will be brought into view in the following discussion.

The Brachyura, or 'short-tails,' form an order entirely consisting of crabs. Intellect or its equivalent places them at the head of the class. Fourteen segments, solidified together and covered dorsally and laterally by a shield or carapace, carry in successive pairs the pedunculate eyes, the first and second antennae, the jaws in six highly diversified patterns, and the trunk-legs, of which the first are chelipeds, grasping organs often unequal in size, while the other four couples are symmetrical, adapted for walking or swimming. The seven remaining segments, sometimes all separate, sometimes in various combinations of coalescence, form an insignificant tail. This is commonly much broader in the female than in the male. In both sexes it folds closely against the animal's breast, except when the mother is using it to clasp the mass of her extruded eggs, or when some parasite occupies the position of those eggs and apparently finds safety by appealing to a deluded instinct. It is a distinctive mark of the genuine Brachyura that the sixth segment of this thinly flattened tail is always without appendages, though these are obscurely indicated in an anomalous group. The creatures spread about the seas and lands of the world, and having in common the curious negative characteristic just mentioned, are surprisingly numerous. They have long been, and for the present still are, arranged in four tribes, the Cyclometopa, or crabs which are arched in front; the Catometopa, in which the proper front is more or less depressed; the Oxyrrhyncha, having this front or interorbital part produced into a pointed, bifid or trifid rostrum; and lastly the Oxystomata, which have the mouth-cavity triangularly shaped forwards, in contrast with its more or less quadrangular form in the other three tribes. In all four the females have the first segment of the pleon or tail devoid of appendages. For discriminating the crabs of Cornwall, few as they are compared with those of all the globe, these main divisions will be found of service. They are themselves split up into many families and sub-families. Neglecting the latter, for the former it will be convenient for us to follow the admirable arrangement supplied by Alcock in his recent 'Carcinological Fauna of India.'² He divides the Cyclometopa into five families, the Telphusidae, Xanthidae, Portunidae, Cancridae, and Corystidae. With the Telphusidae, or river crabs, which should rather be called Potamonidae, the Cornish fauna is not concerned, since they are not represented either here or in any other part of Great Britain. All the families agree in having nine gills in the branchial chamber at each side of the carapace. 'The gills are *phyllobranchiae*; that is to say, the gill-elements are broad thin leaves arranged in two series along a central stem, like the barbs of a feather-vane' (Alcock). To carry off the water which has bathed these breathing-organs, there are channels opening at each side of the so-called palate or mouth-cavity. The genital ducts of the male open on the bases of the last pair of legs. In the second and third families the first antennae fold transversely or in an obliquely transverse direction, whereas they fold longitudinally in the fourth and fifth families. The Xanthidae have the last legs, like the three preceding pairs, ambulatory, but the Portunidae for the most part have the last pair natatory, the terminal joints being widened into swimming paddles. A hard and fast line, however, cannot well be drawn between the two families by any single character. Still less easy is it to distinguish Cancridae and Corystidae by any mark at once steadfast and easy to observe. In the former the epistome is usually of fair length; in the latter it is evanescent. The epistome, or part between the antennular septum and the mouth-cavity, is regarded as the sternum or ventral portion of the segment which carries the second antennae, the sides and back of this segment taking an important but not easily distinguishable share in the formation of the carapace. About a score of Cornish crabs are distributed over these four families.

In the Xanthidae stand the genera *Xantho*, *Xanthodes*, *Pilumnus*, and *Pilumnoides*. (For some unexplained reason or by accident, Jonathan Couch wrote '*Zantho*' instead of '*Xantho*.')³ The species now known as *Xantho incisus*, Leach, but perhaps equivalent to the earlier *X. poressa* (Olivier), he calls in English the 'furrowed crab,' and its congener *X. hydrophilus* (Herbst) the 'less furrowed crab,'

¹ The malacostracan position of *Nebalia* is not established.

² *Journ. Asiatic Soc. of Bengal* (1899), vol. lxxiii, pt. ii.

³ *Cornish Fauna* (1838), p. 67. This work will subsequently be cited as *Fauna*.

CRUSTACEANS

saying of this that it is 'equally common with the last and in similar situations, under stones about low-water mark.' According to Bell this is probably the form mentioned by Leach as a variety of the preceding species, with claws coloured like the carapace. Bell adds that 'Mr. Couch of Polperro was the first to detect it as an English species, and to refer it to its proper name.'¹ Couch called it *Zantho rivulosus*, with a reference to Milne-Edwards. Bell declares it to be undoubtedly the *Cancer hydrophilus* of Herbst, so that he gives Couch credit for naming it properly just after showing that his naming was wrong in every particular. The distinction between the two species is not especially obvious: *X. hydrophilus* has a flatter carapace, with the antero-lateral teeth much less obtuse, the fingers of the great claws brown instead of black, the movable finger grooved instead of plain, and the ambulatory legs more continuously hairy. Cocks records both from localities near Falmouth. A third species was subsequently introduced to science by Mr. R. Q. Couch, who described examples of it taken from near the Runnel-stone in Mount's Bay, in the crevices of *Eschara foliacea*.² He says in a footnote, 'A specimen has been submitted to Professor T. Bell of King's College, London, and he has pronounced it a new species, and has assigned to it the name *Xantho Couchii*.' Bell, in the appendix to his work on the *British Stalk-eyed Crustacea*, describes it as *Xantho tuberculata*, R. Q. Couch, m.s., and declares that 'the name of *tuberculata* has been given to the species by its discoverer.'³ This name refers to the tuberculation of the great claws or chelipeds, which is a distinguishing feature of this little species. Bate⁴ affirms that this species 'was first described by Mr. Bell in his book on the British Crustacea.' But as it only appears in the appendix to Bell's volume, which was completed in 1853, there cannot be a doubt that *Xantho couchii*, Couch, is the earlier and so far the valid name, although the two authors by their reciprocal politeness have confused the matter as much as they well could, with the result that R. Q. Couch may easily be misrepresented as having had the vanity to name his discovery after himself. There has been an inclination to regard this third species as a variety of *X. hydrophilus*, but the eminent French naturalist E. L. Bouvier has vindicated its independence,⁵ and in fact transferred it to another genus, for in a joint work on the Decapoda of the Talisman and Travailleur Expeditions he and his colleague, the late Alphonse Milne-Edwards, say of this species, 'one of us has recently pointed out its essential character, and shown that it ought rather to be ranked under *Xanthodes* than under *Xantho*.'⁶ Why they continue to place it in a genus in which they admit that it had better not be placed is left unexplained. *Xanthodes* is no doubt not very distinct from *Xantho*, but it has the inter-orbital border more instead of less than half the greatest width of the carapace. If both genera are accepted, the species under discussion must now be known as *Xanthodes couchii* (Couch).

The extensive and wide-ranging genus *Pilumnus* (Leach) is here represented only by the little *P. birtellus* (Linn.) called the 'Furry Pilumnus' by Couch, who found it 'common under stones at low-water mark,'⁷ just as Cocks at Falmouth found it 'between the layers of shelving rocks, under stones, Gwyllyn-vase, Swanpool, etc.; common.'⁸ The carapace is distinguished from that of *Xantho* by its hairiness and the sharpness of its antero-lateral teeth. The pleon or tail has in both sexes seven distinct segments, whereas in the male *Xantho* the third, fourth, and fifth are fused into one. *Pilumnoides perlatus* (Poepig) has been sent me from Falmouth by Mr. Vallentin, who found it on a derelict vessel which had been towed into that famous harbour. Whether such an immigrant can rightly be counted in the Cornish fauna may be open to question, but beyond doubt it is an interesting example of the manifold ways in which the distribution of species may be effected. *P. perlatus* is far less pubescent than *Pilumnus birtellus*, and in place of sharp teeth it has the antero-lateral margins subdivided into four unequal granular lobes, from the hindmost of which a slightly concave ridge extends obliquely backward on the carapace.

The Portunidae or swimming crabs furnish many species to this and other parts of England. Several of them belong to the genus *Portunus* (Fabricius), and of these all that are known to be English have also been recorded from Cornwall. The largest is *P. puber* (Linn.), called in France the Woolly crab, more elegantly in England the Velvet crab, from the pubescence on its carapace and limbs. This velvety coat is beautifully slashed by bare spaces of a vivid blue. Couch says: 'The largest keep in water of the depth of a few fathoms, and the smaller about low-water mark,

¹ *Brit. Stalk-eyed Crustacea*, p. 56.

² *Rep. of the Penzance Nat. Hist. and Antiq. Soc.* for 1851, p. 13. Couch's paper stands between others specially dated 1851, the inference being that these essays were published at intervals during that year, although the Report 'for 1851' containing the whole collection would naturally not be issued till 1852.

³ *Brit. Stalk-eyed Crustacea* (1853), p. 359.

⁴ 'Revision,' p. 10.

⁵ *La Feuille des Jeunes Naturalistes*, ser. 3, No. 332 (1898).

⁶ *Op. cit.* (1900), p. 94.

⁷ *Fauna*, p. 70.

⁸ *The Seventeenth Ann. Rep. Roy. Cornw. Polyt. Soc.* (1849), p. 79. The report, though dated 1849, from internal evidence obviously cannot have been published till 1850. The 'Contributions to the Fauna of Falmouth,' by Mr. W. P. Cocks, will be frequently quoted. It will be convenient to abbreviate the reference to *Cornwall Soc.* (1850).

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among stones, beneath which they shelter themselves.¹ But certainly sometimes fine specimens adventure their dauntless steps within tidemarks, and need to be handled with a little caution. *Portunus depurator* (Linn.) is called by Bell the Cleanser swimming crab, the specific name in both languages referring to its function as a scavenger. Couch accepts the later title *P. plicatus*, Risso, alluding apparently to the pleats or sculpturing of the granular but not pubescent surface. He calls it in the vernacular 'Mary crab,' but shows how little distinctive that appellation is by adding, 'There is some difficulty in assigning the proper synonyms to this and the two following species, which are described as inhabiting our coasts, and it is probable that we have one or two more to which none of their descriptions apply. They are all termed Harbour or Mary crabs, and are exceedingly ravenous, fastening eagerly on any animal substance that comes within their reach.'² The two following species alluded to are *P. marmoreus*, Leach, the 'Marbled crab,' and *P. bolsatus*, Fabricius, for which no writer has suggested any English equivalent, but which is called by Costa in Italian, Portuno rasato, the shaven or smooth *Portunus*. Bell believed that the two names referred to one and the same species, but had not the courage to unite them. Cocks records *P. marmoreus* from 'Harbour, Carrack roads, trawl refuse, stomach of fishes; not uncommon'; and of *P. bolsatus*, 'One mutilated specimen in the stomach of the *M. aeglefinus*, 6 December, 1849.'³ Mr. Edward Step, F.L.S., has obliged me with excellent specimens from Portscatho. Victor Carus transfers the united species to Stimpson's *Liocarcinus*, a name signifying 'smooth crab' and a genus in which the fourth joint of the third maxillipeds is produced much beyond the front margin of the mouth-cavity.⁴ It should also be noticed that the distinguished American carcinologist, Miss Mary J. Rathbun, has deprived *Portunus* of all its English species, supposing herself bound to accept as the type of that genus *P. pelagicus*, Fabricius, because Latreille in 1810 mentions that particular species and no other.⁵ But by the same argument *P. depurator* must be the type, because in 1801 Lamarck names that species and no other, and is quoted as doing so by Latreille himself in 1802. So far, therefore, as the argument founded on Latreille is concerned, our English species of *Portunus* stand firm. *P. corrugatus* (Pennant), the 'wrinkled crab,' is mentioned by Couch as scarce. Cocks records it from 'Stomach of fish, Pendower Beach; not common.' White says, 'the Rev. Alfred Norman has taken it, but rarely, in Cornwall'⁶ It is distinguished from *P. depurator* by having its front trilobed instead of tridentate and by the much stronger sculpturing of the carapace. *P. pusillus*, Leach, the 'Dwarf crab,' is much smaller than the rest. Couch marks it common, and Cocks found it at 'Harbour, Bar, Gwyllyn-vase, etc.; not uncommon.' In 1888 Mr. Cornish exhibited to the Penzance Natural History Society 'a specimen of the rather rare dwarf swimming crab (*Portunus pusillus*).'⁷ Cocks also mentions *P. arcuatus*, Leach, from 'Harbour, Carrack roads, Bar, Selley's, Olver's, and Glasson's beaches; common. Two from the stomach of the same fish [*Gadus morrhua*, the cod previously named], 14 December, 1849,' and *P. emarginatus*, Leach, from 'Harbour, low-water mark, spring tide; rare.'⁸ These valuable 'Contributions to the Fauna of Falmouth,' to which reference must here be so frequently made, were seemingly quite unknown to Bell in 1853, and to Bate in 1878. They here help to prove that Leach's *Portunus* with an emarginate front, though rare, is not limited to a single specimen. None the less it may well be, as Leach himself suggests, and as Milne-Edwards and Bell agree in supposing it, specifically identical with the more usual form, *P. arcuatus*, Leach, in which the front is slightly convex instead of slightly concave. The name *emarginatus* has technical precedence. Under the other name White says, 'the Rev. Alfred Norman remarks that this species is abundant in Falmouth harbour in 4 fathoms.'⁹

To the name *Portunus longipes*, Risso, Cocks appends the following observations: 'New to British Fauna, one specimen of this very rare crab was dredged by Professor Forbes, two or three years since, a few miles from Falmouth harbour. The first I found was on the sands, Gwyllyn-vase, after a severe storm in 1845. In 1848 procured two from trawl refuse; 14 December, 1849, three large specimens from the stomach of the *G. morrhua*.'¹⁰ Bell in his appendix says: 'The occurrence of this truly Mediterranean species on our southern coast is interesting, as affording another instance of the partial identity of the fauna of the two shores to which I have had occasion so repeatedly to refer. It had not, I believe, been found on our shores until it was dredged on the coast of Cornwall in the year 1848 by my friends Professor E. Forbes and Mr. McAndrew, from whom I received a male specimen, and subsequently, through the kindness of Mr. Cocks of Plymouth [Falmouth], a female which was taken by that gentleman. I also received a specimen from Mr. R. Q. Couch of Penzance during the year above mentioned. It is doubtless the species described by Mr. Spence Bate as new in the *Annals of Natural History* for 1851, under the name of

¹ *Fauna*, p. 71.

² *Ibid.* p. 72.

³ *Cornw. Soc.* (1850), p. 79.

⁴ *Prodromus Faunae Mediterraneae* (1885), i, 517.

⁵ *Proc. Biol. Soc. Washington* (1899) p. 160.

⁶ *Popular History of British Crustacea* (1857), p. 49.

⁷ *Rep. and Trans. of the Penzance Nat. Hist. and Antiq. Soc.* (1888-89), p. 91.

⁸ *Cornw. Soc.* (1850), p. 79.

⁹ *Popular History*, p. 52.

¹⁰ *Cornw. Soc.* (1850), p. 79.

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Portunus Dalyellii, from a specimen obtained in Oxwich Bay, near Swansea. The lateral spines are very largely developed in the figure given by Mr. Bate, but not more so than in many Mediterranean specimens, and scarcely more than in Roux's figure. It is at a glance distinguished from all other species [of *Portunus*] by the character from which the name has been given, namely, the length and slenderness of the legs.¹ White records it from 'off Falmouth in deep water' on A. M. Norman's authority.² Bate in 1878 rather reluctantly accepts the identification of his South Wales specimen with the Mediterranean species found in Cornwall. In 1885 it was transferred by the late Victor Carus to the genus *Bathynectes*, which signifies a deep swimmer. This was instituted by Stimpson in 1871, and is distinguished from *Portunus* by having no median frontal tooth and by having the lowest of the five antero-lateral teeth much more strongly produced than the others. Bate describes the colour as 'a brilliant reddish brown with darker blotches of the same.'³

Polybius henslowii, Leach, is distinguished from our other Portunidae by its nearly orbicular carapace and by the fact that its second, third, and fourth pairs of limbs share to some extent in the compressed character of the terminal joints by which the fifth legs are converted into an admirable pair of paddles. On the habits of this 'Nipper crab' or 'Henslow's swimming crab,' Jonathan Couch's observations have been quoted in full by Bell and by Bate. Its pertinacity in attacking fish and its skill in swimming have been amply confirmed by other observers. Cocks reports it 'From stomach of the *Gadus morrhua*, *G. aeglefinus*, *Trigla lyra*; not common.'⁴ The Rev. Alfred Norman informed Adam White that he had 'seen the sandy beach between Hayle and St. Ives quite strewn with the exuviae of this crab.' Mr. Edward Step has obliged me with a specimen from Portscatho.

Under the name *Platyonichus latipes*, or 'Widefoot,' Couch introduces the species called by Leach *Portumnus variegatus*. Using the latter name Cocks reports it from 'Gwyllyn-vase Bay, Swanpool, Mainporth, etc.; rare. Hayle, St. Ives Bay, and stomach of fishes; not uncommon.' No doubt it ought to be called *Portumnus latipes* (Pennant). But the name is unfortunate. *Portumnus* is so like *Portunus* that Latreille thought himself (though he was not) justified in changing it into *Platyonichus*. Couch was content to rest the generic definition on the wide and oval termination of the hind legs, in contrast to the 'corresponding part of the other legs straight and unfit for swimming.' Bate is either ironical or too urbane when he says that 'This definition of Couch's is scarcely sufficient to determine the genus from that of *Portunus*.'⁵ It is of course absolutely insufficient, seeing that both genera share these very characters. Bell took up the genus with the amended spelling *Platyonychus* for some of the species assigned to it by Milne-Edwards, but discriminated it from *Portumnus*, for which it was originally only an alternative name. By some accident he attributed to *Portumnus* the broad oval, very much rounded, terminal joint of the fifth legs, which in spite of the name *latipes* its single species does not possess.⁶ The joint in question is acutely lanceolate, and only moderately widened. Bate says: '*Portumnus* is easily detected by the form of the carapace, which is lyre-shaped, and is as long as it is broad.' The antero-lateral teeth are very small. Leach says that the species, 'when alive, is of a yellowish-white colour, mottled with purplish brown.'⁷

To *Carcinus maenas* (Linn.), the common shore crab, carcinology is under considerable obligations. Appreciation is sometimes won by rarity, sometimes by modesty, sometimes by delicacy of structure or monstrous size. But in this case it is abundance, effrontery, hardihood, and handiness that have been valued. On all our shores this crab is at everyone's disposal. It is beginning to colonize Australia.⁸ Nothing scares it. It will change its skin in a finger glass. It will breed easily in captivity. It was especially serviceable to J. Vaughan Thompson, who crowned the researches of many years by his memoir in the *Transactions of the Royal Society* (1835) on the 'Double Metamorphoses of the Decapod Crustaceans, exemplified in *Cancer Maenas*.' On the Zoea and Megalopa stages of this same crab Mr. R. Q. Couch began the careful experiments and observations which he extended to the young of numerous other crustaceans. His papers on this subject give special distinction to the early *Report of the Royal Cornwall Polytechnic Society*.⁹ His results amply confirmed those of Vaughan Thompson, against which untenable objections had been raised by some naturalists otherwise deservedly of the highest authority. Cocks, while stating that the shore crab occurs in

¹ *Brit. Stalk-eyed Crustacea*, p. 362.

² *Popular History*, p. 50.

³ *Ann. Nat. Hist.* (1851), ser. 2, vii, 321. For distinction of this species from *B. superbus* (Costa) see Norman in *Ann. Nat. Hist.* (1891), ser. 6, vii, 272.

⁴ Without giving repeated references to Mr. Cocks's 'Contributions' in the *Cornwall Soc.* (1850), it may suffice to say once for all that the quotations in regard to the Malacostraca are taken from pages 78-84.

⁵ 'Revision,' p. 14.

⁶ *Brit. Stalk-eyed Crustacea*, p. 83.

⁷ *Edinburgh Encyclopaedia* (1813), vii, 391.

⁸ See Fulton and Grant in *Proc. Roy. Soc. Victoria* (1902), p. 55.

⁹ *Cornw. Soc.* (1844), *Eleventh Annual Rep.* p. 28, and (1845) *Twelfth Annual Rep.* p. 17, 'On the Metamorphosis of the Crustaceans, including the Decapoda, Entomostraca, and Pycnogonidae.' For the most recent criticism of Thompson and Couch, see Dr. H. C. Williamson's important paper on the shore crab in the *Twenty-first Ann. Rep. Fishery Board for Scotland*, p. iii, 136 (1903).

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the neighbourhood of Falmouth 'at every point ; common,' adds that there is a variety 'in some localities very common.' Of this, however, he gives no distinguishing characters. But the *Report of the Penzance Natural History and Antiquarian Society* for 1852, no doubt drawn up by R. Q. Couch, says, 'Of the common harbour crab (*C. maenas*) a variety has been brought to the notice of the society, its chief difference being in the waving of the front, there being four instead of three denticulations, and the eyes are wider apart.'¹ Since the young of the species were in those days sometimes mistaken for *Planes minutus*, briefly described varieties must be regarded with some suspicion. Though *Carcinus* is a genus of swimming crabs and has the last legs to some extent widened and compressed, the terminal joint in those legs is narrow, so that the genus may be regarded as in some measure linking the Portunidae to the next family, the Cancridae.

Cancer pagurus, Linn., the great eatable crab, is as shy as the shore crab is bold. Couch, who adopts for it Milne-Edwards's genus *Platycarcinus*, says that the male is called the Stool crab and the female the Bon crab, but offers no explanation of these local names. 'The Bon crab begins to breed when about three inches across the carapace ; and the spawn, after remaining long attached to the parent, is buried beneath some shelter, at all seasons of the year ; but as when engaged in this duty the female feeds but little and commonly hides herself, few of them are taken in the pots. Fishermen mention such instances as somewhat remarkable, though most other crustaceans are familiarly taken with the pea (cluster of eggs) attached.'² In subsequent years Couch published papers on the process of exuviation, especially as exhibited in this species. His son, after discussing the metamorphosis of *Carcinus maenas* and *Portunus plicatus*, says : 'The next species which may be mentioned is the common edible crab, *Platycarcinus pagurus*. This was treated as the others, but as they generally retire to deep water, and are inactive while laden with ova, the supply of specimens was not so great. After several ineffectual attempts I at last succeeded in hatching them. The body is smaller in proportion to the other parts than in the two species previously mentioned. The dorsal shield is shallow, small, and short, being about one-third as long as the tail ; the dorsal spine is long, slender, and bent posteriorly. The eyes are large, sessile, and marked at the circumference of the pupil with radiating lines. The tail is long, stout, and extended, its termination forked.'³ Omitting the rest of his description of the Zoea, we may remark that apparently he failed to rear the second or Megalopa stage, in which the eyes become pedunculate. Success with the edible crab in this particular has not been recorded by other experimentalists.⁴ J. Couch described what he supposed to be a new species as *Cancer incisocrenatus*. The specimen 'was scarcely a fourth of an inch across the carapace, the form and colour resembling those of the common edible crab, but the area was covered with small warty protuberances. On the margin between the ocular cavities were five segments [teeth or lobes], the central most projecting ; on the lateral margin nine crenations, each, as also those between the eyes, distinctly but finely notched. Antennae small, fine, simple, and with the palpi resembling those of the common crab. Hand claws and walking legs short, the two outer segments of the former with a serrated crest ; the finger also notched at its root. Walking legs with short bristles.'⁵ Bate misquotes the name as *Cancer insocrenatus*, which is unmeaning, and, in place of Couch's statement that the area (of the carapace) was covered with warty protuberances, says that 'the antennae were covered with small wavy protuberances.' His comment is : 'Most probably this is the young of some known species. I am not aware that it has been seen by anyone but Mr. Couch. Bell does not notice it. It appears to me to resemble *Pilumnoides* of Edwards and Lucas.'⁶ Bell, however, does notice it, entering it in the synonymy of *Cancer pagurus* as a juvenile specimen.⁷ The number of lateral crenations condemns any identification with *Pilumnoides*, but, while not inconsistent with Bell's opinion, it agrees equally with a different interpretation for which, as will be presently seen, there is far more to be said. In the department of teratology the eatable crabs and lobsters not unfrequently supply curious examples, as shown in the writings of Dr. Walter Faxon⁸ and Mr. L. A. Borradaile, F.L.S.⁹ At a meeting of the Penzance Society 'The Honorary Secretary (Mr. G. F. Tregelles) showed a natural curiosity which Mr. J. T. Fleming had kindly lent to the Society. It was the claw of an ordinary crab (*Cancer pagurus*), from one side of which there grew, at right angles, another small but perfectly formed claw, apparently quite fit for use. He remarked that instances of such redundancy were common in the vegetable world, and exhibited a number of specimens illustrating the phenomenon.'¹⁰ From Plymouth Sound, Mr. Albrecht Bethe

¹ Op. cit. p. 62.

² Fauna, p. 68.

³ Cornw. Soc. (1844), p. 34.

⁴ At least when asked by Dr. H. C. Williamson for the record on which my statement in the *History of Crustacea* (1893), p. 60, was founded, I was unable to give him any reference for it.

⁵ Fauna, pp. 69-70.

⁶ 'Revision,' pp. 12-13.

⁷ Brit. Stalk-eyed Crustacea, p. 59.

⁸ Bull. Mus. Comp. Zool. Harvard (1881), viii, p. 257.

⁹ Journ. of Marine Zoology and Microscopy (1897), No. 8.

¹⁰ Rep. and Trans. Penzance Nat. Hist. Soc. (1890-91), p. 271.

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describes the extraordinary case of 'a *Carcinus* with a right-handed walking-leg on the left side of the abdomen.'¹

There are two other genera of Cancridae of which examples occur in Cornwall. *Atelecyclos septemdentatus* (Montagu) is reported by Cocks from 'trawl refuse, old and young in the stomach of *Gadus aeglefinus*, *Trigla lyra*, *Trigla hirundo*, etc.; common.' Couch says of this species: 'Common in the stomachs of fishes, chiefly Cod fishes and Rays, from the depth of 20 to 50 fathoms: they must abound at these depths, as I have found more than thirty in a single fish, and almost every Ray opened for several days in succession was found to contain them.'² Bell says: 'The general form of the carapace of this species is so nearly circular, as to distinguish it at first sight from all the other brachyurous crabs of our coast. The lateral margins with the front, form somewhat more than a semi-circle, and the latero-posterior margins form three sides of a nearly regular octagon. The whole circumference is fringed with hair. The lateral margin on each side is furnished with nine teeth, which are alternately a little smaller and larger; the front is tridentate, the middle tooth being rather the largest; the whole of the teeth are slightly denticulate. The carapace is granular.'³ There is no real objection to be made to this description, but obviously Montagu, in calling the species seven-toothed, neglected the foremost and hindmost of the lateral teeth, just as Bell, in calling the front tridentate, neglects the additional tooth at each orbit, which would make the front quinquedentate. The carinate hands of the chelipeds combine with the other characters to make it to my mind tolerably certain that Couch's *Cancer incisocrenatus* was really a young *Atelecyclos*. *Pirimela denticulata* (Montagu) is recorded by Cocks from 'Harbour, Gwyllynvase, Castle point; not uncommon.' This little species is at once distinguished from those of the two foregoing genera by its having only five antero-lateral teeth. All three have the pleon five-segmented in the male and seven-segmented in the female, but the two last-mentioned genera are discriminated from *Cancer* by having the third maxillipeds produced over the epistome. By this character they lead on to the next family, the Corystidae.

Corystes cassivelaunus (Pennant) is spoken of by Couch⁴ as 'scarcely common.' Cocks notes its occurrence thus: 'Sands, low-water mark, Swanpool, Penzance, Mainporth, Bream bay, etc.; not uncommon. My daughter procured two living specimens (females) Pendower beach, low-water mark.' Bate says: 'It is common on sandy shores at low water.'⁵ But its habit of burrowing in the sand, noticed by all our authorities, prevents its being commonly seen alive. Dead specimens are sometimes thrown up on to the shore in great numbers. Its carapace, longer than broad, the dorsal markings suggestive of human features, the long slender chelipeds of the male, and the peculiar second antennae, elongate and setose, make this 'Long crab' or 'Masked crab' easy to recognize. Mr. Walter Garstang has pointed out the contrivances by which in various sand-burrowing species the current which bathes the branchiae is filtered, and that when a species is completely embedded a reversal of the current takes place. During this reversal, alike in *Corystes* and *Atelecyclos*, filtration is effected 'by an inhalant sieve-tube formed by the second antennae, with the participation of the third maxillipeds.'⁶

The Catometopa are divided by Alcock into nine families, with many of which we are not here concerned. The first of them, the Goneplacidae, stand so close to the border line that some authorities have ranged its typical genus, *Goneplax* (Leach), among the Cyclometopa. *G. angulata* (Pennant), the 'Square crab' or 'Angular crab,' is reported by Couch as 'common in moderately deep water, and often in the stomachs of fishes,'⁷ and by Cocks from 'harbour, trawl refuse, stomach of the *Raia clavata*, *R. maculata*, *Gadus morrhua*, *Gadus aeglefinus*, *Trigla hirundo*; common.' Like *C. cassivelaunus* the male has chelipeds of remarkable length, but unlike the *Corystes* this species has the carapace broader than long, and unlike all the other crabs of our survey thus far, it has the eye-stalks elongate. J. Cranch is Leach's authority for the repeatedly quoted statement that the members of this species 'live in excavations formed in the hardened mud, and that their habitations, at the extremities of which they live, are open at each end.'⁸ There is no reason for doubting Cranch, but the difficulty of such observations is indicated by the fact that apparently for about ninety years his testimony has never been corroborated. In this species the outer orbital angle forms a prominent and acute tooth, behind which there is a smaller tooth on the antero-lateral margin. *G. rhomboides* (Linn.) is without the second tooth, or at most has only a little tubercle in its place. Cocks records this Mediterranean species at Falmouth, 'from the stomach of the *Gadus aeglefinus*, *Trigla lyra*, *Trigla hirundo*, etc.; scarce.' But he does not specify any character on which he relies for distinguishing this species from its very intimately allied neighbour. If, as many think, they are identical, the name *rhomboides* has the priority. A much more considerable difficulty is

¹ *Journ. Marine Biol. Assoc.* (1895-97), iv, (New Ser.), p. 144.

² *Fauna*, p. 74.

³ *Fauna*, p. 74.

⁴ *Brit. Assoc. Rep.* for 1896.

⁵ *Malacostraca Podophthalmata Britanniae*, text to Plate XIII (1 March, 1816).

⁶ *Brit. Stalk-eyed Crustacea*, p. 153.

⁷ 'Revision,' p. 23.

⁸ *Fauna*, p. 72.

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involved in the species which Couch describes as *Gelasimus Bellii*,¹ which Bell, in whose honour it was named, thinks may probably 'prove to be the female or young male' of *Goneplax rhomboides*,² and which Bate prudently does not attempt to identify, leaving it as 'a very doubtful species' to the conjecture of future observers.³ Unfortunately the figure of which Couch speaks was seemingly never published, and his description tantalizingly leads to no decision. The species, he says, is 'frequently found in the stomachs of fishes taken in depths varying from five to more than twenty fathoms.' Though the carapace is in general like that of *Goneplax* and has two well-marked teeth or hooks on the lateral margin, the inter-orbital front is more advanced, so that, when the eye-stalks are withdrawn into their orbital cavities, their extremities point a little backward. 'Both claws are of equal size, and less than the transverse breadth of the carapace.' Couch expressly adds: 'I find but little difference in the form of the male and female, and none in the proportions of the claws, though such is the case for the most part in crustaceans.' If he had at command adult specimens, this last remark would decisively dismiss *Goneplax*, in which the chelipeds of male and female differ greatly in size, and it would be no less opposed to *Gelasimus* (now called *Uca*), in which the male alone has one cheliped monstrous in size compared with the other. Couch's reference to Plate XVIII, Fig. 10, in Milne-Edwards's *Histoire naturelle des Crustacés*, which represents *Gelasimus annulipes*, does not of itself throw any light upon the matter.

In the family Grapsidae, Cornwall may not unfairly be credited with the little squarish, broad-fronted, 'Floating crab,' so well known in the Sargasso Sea and otherwise widely distributed. I have myself received it from the gulf-weed, from South African waters, and from the Falkland Islands. It varies much in colouring. It has been sometimes called *Planes Linneana*, and sometimes *Nautilograpsus minutus*, but the more correct name is *Planes minutus* (Linn.). Couch sent to Bell 'a very young specimen from the Cornish coast, which is extremely small, being not more than a line in breadth.'⁴ Bell adds: 'It is quite perfect, although so small, and is of a very pale grey colour, with small dark dots.' Cocks found it at 'Bar, Castle-point, after a storm, October, 1845,' and 'one mutilated specimen, 1848, from the stomach of a fish.' At a later date Couch reports two full-grown examples adhering closely under the tail of a Hawk's-bill turtle taken in the Channel not far from the French coast and brought alive into Polperro.⁵ R. Q. Couch, in the *Report of the Penzance Natural History Society for 1848*,⁶ writes: 'Among the crustaceans we have one new species to be added: this is not only a novelty to the county, but to the kingdom. It is a species of *Grapsus*, and was taken below the baths in Mount's Bay. The recognized species on our coast is *G. Linneana*, and that is so rare that but little is known of its history or habits. Several species inhabit the Sargasso or gulf-weed, but the Cornish species was found amid the roots of the *Laminaria digitata*, the common sea-weed of our shores.' The new *Grapsus* was perhaps only the accustomed *Planes*, which, having strayed away from the Sargassum bacciferum, had taken refuge in the sea-weed, and from some difference in colouring was supposed to be a novelty.

The family Pinnotheridae supplies the minute 'Pea-crabs,' *Pinnotheres pisum* (Linn.) and *P. veterum*, Bosc. Of the former Couch says: 'This species seems rare with us, and only found in the Mussel shell, the natural inhabitant of which it either finds diseased, or renders so. I have never found it in the Pinna, as reported by authors, though many have been examined for that purpose.'⁷ Cocks says that it is 'found between the folds of the mantle of the *Mytilus edulis*, *M. incurvatus*, *cardium echinatum*, etc.: not uncommon.' Of *P. veterum*, which Bell calls the 'Pinna Pea crab,' Couch, who calls it the 'Ancient Pea crab,' says 'this is more rare than the last named.' Cocks says that it is 'found between the folds of Pinna ingens, *Modiola vulgaris*, etc., from deep water: not uncommon.' In the first species the male has an arched front, in the second the front is emarginate. In the female of the first the pleon is broader than long, in the second it is longer than broad.⁸ It would be interesting to know whether Couch's opinion as to the conditions of companionship between a Pinnotheres and a Mussel were based on his own observations or not.

The Oxyrrhyncha of late years have excited wide-spread interest by the correlation between various points in their structure and their practice of wearing clothes. They have hairs, spines, and tubercles well adapted for retaining the marine flora and fauna or the mud and sand with which they are so frequently overlaid. It is now known that in carrying this disfiguring burden the shell of the crab ought not to be compared to the field of the slothful. It is a cultivated field. The nippers of the crab have their articulations nicely calculated for reaching the different parts of the body to which disguising materials are to be attached. When circumstances render a particular raiment inappropriate, it is taken off and a more suitable covering assumed in its place. When the artificial dress is lost by the periodical shedding of the natural coat, the fresh surface is not

¹ *Fauna*, p. 73.

² 'Revision,' p. 19.

³ *Brit. Assoc. Rep.* for 1867, and 'Revision,' p. 21.

⁴ *Fauna*, p. 72.

⁵ *Brit. Stalk-eyed Crustacea*, pp. 130, 132.

⁶ *Brit. Stalk-eyed Crustacea*, p. 137.

⁷ *Brit. Stalk-eyed Crustacea*, pp. 121, 126.

⁸ *Op. cit.* p. 178.

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left naked, but clothed again by the crustacean's industrious fingers. So long ago as 1865 Mr. Spence Bate remarks, 'In *Pisa* this is no accidental occurrence, since all the spines are sharp-pointed and curved, and my friend Mr. Whitford has informed me that he has observed specimens in his aquarium which, soon after having cast their exuviae, pick up with their claws pieces of weed and place them on the spine.'¹ So in 1900, A. Milne-Edwards and E. L. Bouvier carefully stripped specimens of their new species *Achaeus cursor*, and saw them skilfully put pieces of bryozoa and corallines on their legs and carapace till those parts gradually disappeared from view.²

The Cornish genera of this tribe are distributed over three families: Inachidae, Hyadidae, and Mamaiidae. In the first the eyes are without orbits; in the second with imperfect orbits, which cannot conceal the cornea; in the third they are with or without orbits, but have in any case protecting processes, and in the English species can entirely conceal the fully retracted cornea from dorsal view.³

Of the Inachidae, Cornwall has six species. *Macropodia rostrata* (Linn.), 'The long-legged spider crab,' often called *Stenorrhynchus* (or *Stenorynchus*) *phalangium*, was not known as Cornish to Couch in 1838, but Cocks reports it from 'Harbour, trawl refuse, crevices of rocks and under seaweeds, low-water mark; Gwyllyn-vase, Swanpool, etc., not uncommon'; and Bell says that he has joined it from the coast of Cornwall.⁴ *Macropodia tenuirostris*, Leach, distinguished from the preceding by its much more elongated rostrum, was found by Leach to be a very common inhabitant of all the deep water off the south-west coast, 'especially in the Sound of Plymouth.'⁵ Couch, who calls it the 'Smaller sea-spider,' and uses for it the specific name *longirostris* (now shown to be a synonym of the above-mentioned *rostrata*), says that it is 'common at the depth of from two to twenty fathoms, and often taken in crab-pots.'⁶ The little *Achaeus cranchii*, Leach, 'Cranch's spider-crab,' is peculiarly a child of the county, having been first discovered by Mr. John Cranch in dredging off Falmouth.⁷ Twenty-three years later Couch speaks of it as 'a rare species, the only British recorded specimen having been taken at Falmouth.'⁸ Cocks in 1850 reports it from 'Gwyllyn-vase, south; extreme low water mark, spring tide, on *Sertularia pumila*; very rare, only three recorded specimens.' *Achaeus* is distinguished from the preceding genus by the form of the rostrum, which consists of two short lobes instead of two long spines, but shares with it the peculiarity that the eyes are not retractile, whereas in *Inachus* they can be in a measure retracted by being laid back against the carapace. All the three genera have the pleon six-segmented in both sexes through coalescence of the last two segments. *Inachus dorsettensis* (Pennant) is recorded by Couch as, 'commonly taken in crab-pots within a few miles of the shore at all depths.'⁹ He calls it the 'Scorpion sea-spider,' with reference to the specific name used by J. C. Fabricius. Cocks reports it from 'Harbour, Carrack Roads, trawl refuse: low-water mark, Gwyllyn-vase; common.' *I. dorynchus*, Leach, according to Couch, who calls it the 'Feeble Inachus,' is not uncommonly found on board crab-boats.¹⁰ It is reported by Cocks from 'Harbour, Carrack Roads, trawl refuse; common, under stones. Gwyllyn-vase; not uncommon.' In the cardiac region, that is the hinder, but not quite the hindmost part of the carapace in the median line, this species has three small tubercles where the 'Scorpion' has one that is large and spiniform, and there are several other similar distinctions, which, however, the student will not find easy to observe until he has carefully undressed his specimens. From both of the foregoing species *I. leptochirus*, Leach, is separated by superior size, more slender chelipeds, and a round polished tubercle on the breast of the male. This species was discovered by Cranch, and Leach, writing after the death of that assiduous collector, was uncertain whether he had found it on the coast of Devon or Cornwall.¹¹ Couch, taking from Milne-Edwards the name *I. leptorhynchus*, calls it the 'Small-snouted Inachus,' but is evidently not quite clear about the species or any Cornish locality for it.¹² Cocks however notes it under its proper name from 'Trawl refuse; not uncommon,' and adds 'September 2nd, 1848, Dr. Vigurs found six males and one female in a small basket of refuse. A male in my cabinet measures 9 in. from toe to toe.'

The family Hyadidae takes its name from Hyas, established by Leach as the third genus in a division, of which *Eurynome* was the fourth, *Blastus* the fifth, and *Pisa* the sixth, the last two being now recognized as identical. *Hyas araneus* (Linn.), and *H. coarctatus*, Leach, do not appear in Couch's *Fauna*, but Cocks records both from 'Harbour, Carrack Roads, trawl refuse; not uncommon.' The specific name of the second species refers to a much stronger lateral constriction of the

¹ Report of the Committee appointed to explore the Marine Fauna and Flora of the South Coast of Devon and Cornw. Recorder, C. Spence Bate. *Brit. Assoc. Report* for 1865 (1866), p. 52, the Committee included Jonathan Couch and others.

² *Decapoda du Talisman et du Travailleur*, p. 162.

³ See Alcock, *Journ. Asiat. Soc. Bengal* (1895), vol. lxiv, pt. ii, pp. 160, 161.

⁴ *Brit. Stalk-eyed Crustacea*, p. 4.

⁵ *Malac. Podophth. Brit.* (1815), text to Pl. XXIII.

⁶ *Fauna*, p. 64.

⁷ *Malac. Podophth. Brit.* (1815), text to Pl. XXII.

⁸ *Fauna*, p. 65.

⁹ *Ibid.*

¹⁰ *Ibid.*

¹¹ *Malac. Podophth. Brit.* (1817), text to Pl. XXII.

¹² *Fauna*, p. 65.

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carapace than is found in the first and larger species. It may be questioned whether this contributes more than a variety, and whether the variation itself may not be one that disappears from specimens which attain a large size. Bell says that Mr. Couch sent it him from Cornwall, but does not specify whether he is referring to the father or the son, both of whom were his correspondents.¹ The genus is distinguished from *Blastus* by the widened second joint of the outer antennae and by having the fingers of the walking legs smooth instead of pectinate. *Blastus tetraodon* (Pennant), the 'Four spined sea-spider,' is marked by Couch as 'not common,'² and by Cocks as found in 'Carrack Roads, east of lighthouse, trawl refuse; rare.' *B. tribulus* (Linn.) is perhaps the same as *Arctopsis lanata*, Lamarck, under which name Cocks records it from 'Harbour, Carrack Roads, east of lighthouse, trawl refuse, etc.; not uncommon.' It is the *Cancer biaculeatus* of Montagu, the *Pisa gibbsii*, which Leach describes as not an uncommon species on the southern coast of Cornwall, inhabiting deep water, and taken by the trawl net,³ and which, under the name of 'Gibbs' sea-spider' Couch notes as 'not uncommon in from one or two to twenty fathoms of depth, and taken in crab-pots.'⁴ Of the four strong lateral teeth in *B. tetraodon* only the lowermost is well represented in *B. tribulus*, the male of which is also well distinguished by the rostrum, for this is about the length of the rest of the carapace, instead of being only about a third as long, and its two horns are scarcely at all divergent at the apices. *Eurynome aspera* (Pennant), at one time referred to the Parthenopidae, has after the fashion of that family a coat rugged with tubercles, and in the males the chelipeds much longer than the following legs. Couch apparently had not seen this little species at Polperro and marks it 'rare.'⁵ Leach reports it as found by dredging in deep water on the coast of Cornwall and neighbouring counties, and figures specimens sent him by his 'very industrious friend, C. Prideaux, Esq., who obtained them from the trawl-fishers of Plymouth Sound.' He adds that 'many of the tubercles on the back of the shell have a cauliflower sculpture.'⁶ Cocks records it 'under stones, low-water mark, Gwyllyn-vase; scarce. Trawl refuse, etc.; common.'

The family Mamaiidae is here represented only by the genus *Mamaia*, a name which must supersede the preoccupied and otherwise untenable *Maia* of Lamarck.⁷ The orbits are deep and fenced with spines, one of which belongs to the broad base of the outer antennae. Leach says that *M. squinado* (Herbst) 'is extremely common in deep water off the south-western coasts of Devon and Cornwall, being called by the fishermen King-crab or Thorn-back.'⁸ Couch calls it 'Corwich crab or Skerry,' and says 'this in its season is the most abundant species of the family, and by far the largest, sometimes weighing as much as five pounds, and the carapace measuring nine or ten inches in length; so that it is commonly used as food, though only by poor people and fisher boys, who find it a delicate meal. Its not tempting form and the small size of the legs conspire to exclude it from the tables of the rich.'⁹ Many interesting remarks on this species from the pen of Mr. Richard Couch are quoted by Bell,¹⁰ and these are repeated by Bate in his revision of Couch's *Cornish Crustacea* as though they had been written by Mr. Jonathan Couch. Cocks finds the species in 'crab-pots, trawl refuse, etc.; common.' As distinguished from the six species of *Inachidae*, the six species of the last two families all have the pleon seven-segmented in both sexes.

The Oxystomata furnish Cornwall with three small species all belonging to the genus *Ebalia* (Leach), in the Leucosiidae. In this family the branchiae are fewer than nine in number on either side, and the afferent branchial channels are found on either side of the endostome or buccal cavity, the efferent canals in Oxystone crabs not lying at the sides but traversing the endostome in the middle line.¹¹ *Ebalia tuberosa* (Pennant), *E. tumefacta* (Montagu), and *E. cranchii*, Leach, all are recorded by Cocks from 'trawl refuse; not uncommon.' Couch had himself only met with the second. Of this Leach says, 'I have obtained it from the Sound of Plymouth through the liberality of Mr. C. Prideaux. I have seen but one male, which differs from the female in not having the dorsal tubercles tumid.'¹² Of his own *E. cranchii*, Leach says, 'this species was discovered by that enterprising naturalist Mr. J. Cranch (whose death in the late expedition to Congo has been so much lamented by naturalists), in the sound of Plymouth, where Mr. C. Prideaux has likewise observed it, in considerable plenty, and has supplied my collection with a complete series.'¹³ Leach and Bell agree that in *E. tuberosa* the pleon has the third to the sixth segments united, that in *E. cranchii* the third to the fifth are united in the pleon of the male, and that the fourth to the sixth

¹ *Brit. Stalk-eyed Crustacea*, p. 36.

³ *Malac. Podophth. Brit.* (1815), text to Pl. XIX.

⁵ *Ibid.*

⁷ See Stebbing, *South African Crustacea*, pt. iii, p. 22 (1905).

⁸ *Malac. Podophth. Brit.* (1817), Pl. XVIII.

¹⁰ *Brit. Stalk-eyed Crustacea*, p. 42.

¹¹ See Alcock, *Indian Decapod Crustacea* (1901), pt. i, p. 19.

¹² *Malac. Podophth. Brit.* (1817), text to Pl. XXV.

¹³ *Ibid.*

² *Fauna*, p. 65.

⁴ *Fauna*, p. 65.

⁶ *Malac. Podophth. Brit.* (1815), text to Pl. XVII.

⁹ *Fauna*, p. 66.

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are united in the pleon of the female both of that and the remaining species, *E. tumefacta*. A. Milne-Edwards and Bouvier corroborate these statements in 1900. Leach adds that in the last-named the pleon has the sixth and seventh segments united as well as the group from the third to the fifth. Pennant's *Ebalia* is further distinguished from the other two by the cruciform swelling on the carapace, and Cranch's from Montagu's by the more slender elongate 'arms' of the chelipeds.

The *Brachyura anomala* or *Dromiacea*, unlike the genuine *Brachyura*, have a pair of appendages on the first pleon segment of the female. They make a late and scanty appearance in the Cornish fauna, for though a species of *Dromia* is figured and described in Leach's celebrated work, *Malacostraca Podophthalmata Britanniae*, the figures on Plate XXIV, A, and the description of *D. mediterranea*, Leach, were added in 1875 by Mr. George Brettingham Sowerby, F.L.S., who writes: 'This very hirsute species frequently becomes covered with sponges, so that little of the shell is visible. Although long known as a Mediterranean crab, its existence in our seas has only been recently discovered. The figure is taken from a large specimen now in the British Museum, which was dredged off Penzance, and for some time lived captive in a tank.' Sowerby himself, however, gives a reference to the *Zoological Journal* (1825), vol. i, p. 419, which shows that John Edward Gray had noted the occurrence of this species on the English coast as early as 1824. The name *Dromia mediterranea*, Leach, quoted by Gray, was perhaps unaccompanied by any description, otherwise it would have preference over *D. vulgaris*, Milne-Edwards. This western species agrees very nearly with the oriental *D. rumbii* (Fabricius), but is larger and has the carapace raised into bosses instead of being smooth, besides showing some differences in the lateral teeth. With the red fingers of the chelipeds and the two little hinder pairs of legs laid on the back, this great furry globose species makes an impressive object. It should be noted that in the family Dromiidae the gills are phyllobranchiae, fourteen to sixteen on each side, that the pleon is seven-segmented in both sexes, and that between its sixth and seventh segments there are two little lateral plates, which at least with some probability represent the appendages of the sixth segment that in the genuine *Brachyura* are always missing.

The *Macrura anomala* are subdivided into *Paguridea*, *Galatheidea*, and *Hippidea*. With members of the first two divisions Cornish waters are rather liberally supplied, and as all our Pagurids have the abdomen or pleon very little calcified and more or less twisted to suit their borrowed habitations, they are easily distinguished from the Galatheids, in which the pleon is crustaceous and symmetrical. Both groups are distinguished from the *Brachyura* by the well-developed appendages of the sixth pleon segment.

Among the very few notices of Cornish Crustacea which the eighteenth century supplies we have this observation by Borlase: 'Of the shrimp kind, great quantities are taken in Helford Harbour, Mount's Bay, etc. in calm weather. Here we often find the hermit-shrimp, bernard, or *cancellus*, remarkable for taking possession of some empty shell, and there fixing his habitation as firmly as if it were his own native place; when it marches, it draws the shell after it; in danger retires wholly into it, and guards the mouth with one of its forcipated claws.' A footnote says, 'Some have erroneously imagined that this was a young lobster!'¹ The knowledge was gradually acquired that 'hermit-shrimps' are not all of the same species, but the Cornish Paguridae were all in the first instance referred to the one genus *Pagurus* of J. C. Fabricius, and even in 1878 this arrangement is retained by Spence Bate. They are, however, now distributed among several genera. Professor E. L. Bouvier has supplied the student with a useful clue to the intricacies of the family.² The genera *Eupagurus* (Brandt), *Spiropagurus* (Stimpson), and *Anapagurus* (Henderson), agree in having the third maxillipeds clearly separated at the base, and the right cheliped generally stronger than the left. But *Pagurus* (Fabricius), as now restricted, *Diogenes* (Dana), and *Calcinus* (Dana), have the third maxillipeds contiguous at the base, and the chelipeds generally subequal, or the left stronger than the right. In the first group *Eupagurus* has no salient point at the sexual orifices on the basal joint of the male's last thoracic legs, but *Spiropagurus* has such a process forming a tube long and spirally coiled, while *Anapagurus* has a simply curved tube, the tube in each case being situated on the basal joint of the left leg. In the second group, although the three genera agree in having no salient sexual appendages, *Pagurus* alone has horny tips or nails to the chelipeds, and *Diogenes* alone has a movable process on the ocular segment between the ophthalmic scales. In *Eupagurus* the three Cornish species are thus distinguished by Bouvier. *E. cuanensis* (W. Thompson) has the upper surface of the right chela very hairy and furnished with numerous sharp tubercles of which the strongest are grouped in longitudinal series, and the inner margin of this chela is straight, the outer much arched. In *E. prideaux* (Leach) and *E. bernhardus* (Linn.) the right chela has its upper surface scarcely at all hairy, but furnished with granules or numerous tubercles that are sometimes sharp, and both margins usually a little arched. In *E. prideaux* the granules or fine denticles are almost all equal, while in *E. bernhardus* the granules or denticles are rather strong and become

¹ *The Nat. Hist. of Cornw.* (1758) by William Borlase, A.M., F.R.S., Rector of Sudgran, p. 274.

² *La Feuille des Jeunes Naturalistes* (1886), ser. iii, 26^e Année, No. 308.

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larger near the middle of the palm, where they form two sub-parallel longitudinal series. A. Milne-Edwards and Bouvier¹ agree with other writers that *Pagurus streblonyx*, Leach, and *P. ulidia* or *ulidianus*, W. Thompson, cannot be distinguished from *E. bernhardus*, between which and its near ally *E. prideaux* there has been frequent confusion. The latter is notable for its steadfast association with the sea-anemone, *Adamsia palliata*. Cocks reports *E. bernhardus* from 'Trawl refuse, crab pots, etc.; common,' and an undescribed variety of his own from 'Gwyllyn-vase, low-water mark; not uncommon'; *E. prideaux* from 'Harbour, Carrack road, Gwyllyn-vase Bay, trawl refuse, etc.; not uncommon'; *E. cuanensis* from 'Harbour, Gwyllyn-vase Bay and rocks, low-water mark; not uncommon,' and an undescribed variety of this from 'Gwyllyn-vase, low-water mark, spring tide; not common'; and also *E. ulidianus* from 'Gwyllyn-vase, Swanpool, etc.; not uncommon.'

The difficulties connected with the study of these hermits are illustrated by the fortunes of the 'Rough-clawed hermit crab,' named *Pagurus Forbesii* by Bell, who says: 'I discovered it amongst some small *Paguri* which I received through the kindness of Mr. Cocks, of Falmouth.'² Mr. Cocks (not Corks) gives *P. Forbesii* (Bell), from 'Harbour, Gwyllyn-vase, low-water mark; not uncommon, first discovered by me in January 1844.' Bate, in 1878, takes no notice of it, but it was called *Eupagurus Forbesi* by Heller in 1863, *E. Forbesii* by Carus in 1885, identified with *E. sculptimanus* (Lucas) by Norman in 1886,³ named *Spiropagurus Forbesii* by G. O. Sars in 1889, and in 1896 Bouvier considers that possibly or even probably it ought to be transferred to the genus *Anapagurus*. That genus will on this hypothesis cover three Cornish species, *A. forbesii* (Bell), *A. laevis* (W. Thompson), and *A. hyndmanni* (W. Thompson). Cocks reports the last as *Pagurus Hyndmani* from 'Harbour, Gwyllyn-vase Bay, Swanpool; common,' and gives *P. laevis* from 'Harbour, Gwyllyn-vase; not uncommon. Trawl refuse; common.' The *Report of the Penzance Natural History Society* for 1852 says: 'Of the hermit crabs we have to record the capture of the common hermit, Prideaux's hermit, *P. laevis* and *Handymanii*, besides two others; and the *Munida Rondeletii* has been taken off the Runnel stone.'⁴ *P. Handymanii* is no doubt an unintentionally amusing variant for *P. hyndmanni*. This species is distinguished from *A. laevis* by having the right chela broadest at the base of the finger instead of higher up the palm, with a more distinctly dentate line on its outer margin, which becomes very salient and forms a sort of lateral carina on the fixed finger. From both of these Bouvier distinguishes *A. forbesii* by the circumstance that in that species both margins of the right chela are very granular and strongly dentate.

In 1851 Spence Bate described as a new species *Pagurus Dillwynii* from Swansea, and said: 'Mr. Couch has informed me since this has been in the hands of the printer that he has also found the species in Cornwall.'⁵ Bell borrows Bate's description and figure, misprinting the name as *Dilwynii*.⁶ In 1878 Bate says, 'This species was first found in South Wales, several years ago, and no naturalist appears to have met with it since. In the summer of 1865 I again met with it in tolerable abundance. I took it with a dredge off the entrance to Plymouth Sound, and seeing it with a number of shrimps in the basket of a fishwoman at Teignmouth, I purchased the entire stock, and hastening to the beach, there, with the incoming tide I took many specimens, which I kept alive. This, the prettiest of all the pretty genus, has the habit of burrowing in the sand, and it is probably [owing] to this circumstance that it has not been met with more frequently.'⁷ In the same place Bate refers to his determination, published in the *British Association Report* for 1865, that *Prophylax* (Latreille) and *Glaucothoe* (Milne-Edwards) represent a free-swimming immature stage of *Pagurus*. In 1863 Heller transferred *P. Dillwynii* to the genus *Diogenes*,⁸ and in 1886 Norman identified it with *D. varians*, Costa,⁹ which is now known by the still earlier name *D. pugilator* (Roux), 1828.

The last of our Pagurids is not the least perplexing. Cocks in 1850 supplies the following record: '*Pagurus Bellii*, Cocks.—I procured this beautiful and rare crab from trawl refuse, November, 1845.' Bell in his Appendix, 1853, describes the 'Blue-banded hermit crab' as '*Pagurus fasciatus*, Mihi,' and follows up his account of the species by saying, 'The whole of the above description is given from a coloured drawing, for which I am indebted to Mr. Cocks, of Falmouth, and from which also the wood-cut is taken. It was taken by him at Falmouth. I have never seen a specimen, but I am confident that Mr. Cocks's accuracy of delineation may be implicitly relied on.' He further says: 'The distinct alternate bands of blue and red render it one of the most beautiful of the genus.'¹⁰ Bate in 1878 disposes of it under '*P. hyndmanni*' by saying '*Pagurus fasciatus* is evidently this species also,'¹¹ forgetting 'the unparalleled proportional length of the internal antennae' and several other differences pointed out by Bell in *Anapagurus hyndmanni*.

¹ *Decap. du Talisman et du Travailleur*, p. 242.

² *Brit. Stalk-eyed Crustacea*, p. 187.

³ *Op. cit.* p. 63.

⁴ *Brit. Stalk-eyed Crustacea*, p. 377.

⁵ *Die Crustaceen des südlichen Europa*, p. 316.

⁶ *Brit. Stalk-eyed Crustacea*, p. 375.

⁷ *Museum Normanianum*, pt. iii, p. 7.

⁸ *Ann. Nat. Hist. ser. 2*, vol. vii, p. 320.

⁹ 'Revision,' p. 26.

¹⁰ *Museum Normanianum*, pt. iii, p. 7.

¹¹ 'Revision,' p. 25.

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Bouvier in 1896 says: 'As for Bell's *Pagurus fasciatus*, it is almost certainly a distinct species, hitherto peculiar to the British Isles, but it is too little known for its generic position to be fixed. It is notable for its oval chelae, of which the right is smaller than the left, for the very short wrist of its anterior feet, for its unarmed appendages, and above all for the transverse bands, alternately blue and red, which adorn the latter. It might well be a *Calinus*.'¹

The Galatheidea embrace the crab-like Porcellanidae and the lobster-like Galatheidae. In the former family Cocks reports *Porcellana platycheles* (Pennant), from 'Bar, Gwyllyn-vase, Swanpool, etc.; very common.—*Var.*: equally common,' and *P. longicornis* (Linn.), from the same localities, also very common. Bell and Bate agree in thinking that the minute *P. acanthocheles* which Couch describes² is a young *P. longicornis*. Leach calls *Galathea strigosa* (Linn.) the Plaited lobster, Couch calls it the Plated lobster, and records it as common. Of *G. squamifera*, Leach, he says, 'Common, under stones at low-water mark.'³ Cocks reports both from 'Bar, Gwyllyn-vase, Swanpool,' the former as not uncommon, the latter as very common. He adds *G. nexa*, Embleton, and a variety of the same, both from 'Gwyllyn-vase, trawl refuse; not uncommon.' He also reports '*Munida Rondeletii*, Bell.—Adults from trawl refuse: young specimens under stones, low-water mark, spring tide; not uncommon. One in my cabinet measures 7 inches and $\frac{1}{4}$ of an inch in length.' This last species is the *Astacus bamffius* of Pennant, more properly called *Munida rugosa* (Fabricius). Bell gives the length as 3 in., and Cocks probably by a loose way of reckoning includes the long chelipeds in his measurement. Bell 'received it from Falmouth through the kindness of Mr. Cocks.' Earlier it had been found in Plymouth Sound by Mr. Prideaux, and later Bate says, 'I have taken this species, which is rare on the stony ground, in from 20 to 30 fathoms off the Dudman.'⁴ Of *G. squamifera*, which he calls *G. squamosa*, Bate says that it 'is not so frequent as *G. strigosa* and frequents deeper water.' Of *G. nexa* he says 'We have taken this specimen [? species] off the Cornish coast in 40 fathoms of water'; of *G. dispersa*, Bate, 'This is a smaller species than the two preceding, and is among our commonest form [forms] beyond low water'; of *G. Andrewsii*, Kinahan, 'This species was first found off the coast of Cornwall, but described by Prof. Kinahan from a female taken in Dublin Bay. It has since been described by Mr. Spence Bate from a male taken off the Cornish coast, the male differing from the female in having a much longer pair of chelate limbs. This species is tolerably frequent on the zoophytic ground from 10 to 50 fathoms, and the female is apparently much more abundant than the male. It is perhaps the smallest species of our local forms.' Lastly, under the heading '*Galathea digidistans*, Spence Bate,' he quotes from the *Report on the marine fauna and flora of the South Coast of Devon and Cornwall*⁵ his own account of a supposed new species *G. digitidistans*, in which the fingers of the chelae leave a gap or considerable distance between their inner margins even when closed.⁶ At the time he suggested that it might be only an extreme form of the male of *G. squamifera*, and that suggestion is generally accepted as correct. *G. Andrewsii* is now recognized as identical with *G. intermedia* (Lilljeborg). It thus appears that in Cornwall there are five species of *Galathea* and one of *Munida*. A key for discriminating all these was supplied by Monsieur Jules Bonnier in 1888,⁷ and has since been made available for English readers.⁸ In Bell's often quoted work will be found an interesting account by R. Q. Couch, describing the habits of *G. strigosa* and its youngest stage. But for the metamorphoses of *Galathea*⁹ and of many other Macrura the student should consult the successive essays of G. O. Sars, the illustrations to which will prove fruitful in instruction even to those who cannot read the Dano-Norwegian text.

The genuine Macrura are not very sharply separated from the anomalous group. But they have no twisting of the pleon nor crab-like flexure of it. To these waters they supply several species of rather exceptional interest. They are divided among several tribes, the first of which, the Thalassinidea, is here represented by two families, the Callianassidae and the Axiidae. *Callianassa subterranea* (Montagu) is mentioned by Couch, though he does not specify whether or where he himself had found it. But Cocks gives it from 'stomach of the Trigla lyra, Trigla hirundo, etc.: not uncommon. Helford, Pendower Beach, etc.: occasionally.' *Upogebia stellata* (Montagu) and *Upogebia deltidura* (Leach) are both recorded by Couch, who says: 'I find what appears to me to be the latter species in abundance in Ray fish (*Raia maculata* and *R. clavata*) caught in from 30 to 50 fathoms of water.'¹⁰ Cocks found the former 'in the stomach of *Gadus aeglefinus*, Trigla lyra: common, living specimens not uncommon at Helford,' and the latter 'in the stomach of the *Gadus aeglefinus*, etc.: common; living specimens not uncommon at Helford and Pendower Sands.' The question seems to be still open whether we have to do with two species or only one. The

¹ *La Feuille des Jeunes Naturalistes*, No. 308, p. 9.

² *Ibid.* pp. 76, 77.

³ *Rep. Brit. Assoc.* for 1867.

⁴ *Bulletin scientifique de la France et de la Belgique* (1888), pp. 41, 78.

⁵ *Hist. of Crustacea*, (Internat. sci. ser.) vol. lxxiv (1893), pp. 175, 176.

⁶ *Archiv für Mathem. und Naturv.* (1889).

⁷ *Fauna*, p. 76.

⁸ 'Revision,' p. 28.

⁹ 'Revision,' pp. 28, 29.

¹⁰ *Fauna*, p. 78.

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generic definition regards the claws as imperfectly chelate, while in *U. deltäura*, which in Bell's opinion may be the female of *U. stellata*, Bell represents this imperfection as vanishing. A similar vagueness prevails in species of the next genus. On *Axius stirynchus*, Leach, the following comment is made by Couch: 'The male of what I judge to be the same species differs from the female, in the snout, which in my specimen of the latter was finely notched, and without the well-marked longitudinal ridge of the former. The outer antennae of the male are furnished with a ridge of firm hair on their inward line, decreasing towards the point, which the female is without, and the former also has well-marked brushes near the lateral edges of the abdominal rings. This species, like those of the genus *Callianassa*, has the habit of burrowing in the sand, from which it rarely emerges; and then it seeks shelter in a crevice covered with weeds, for it is sluggish in its motions, and if distant from a soft bottom in which to sink, incapable of escaping an enemy. A female, that I obtained loaded with spawn, was dug out of the sand in the middle of summer.'¹ Of this species Cocks says: 'Perfect specimens rare. Arms, heads, and mutilated bodies in the stomach of the *Gadus aeglefinus*, *Trigla lyra*, *Trigla hirundo*, etc.: not uncommon, Helford and Pendower Sands, low-water mark: very rare.' In 1856, R. Q. Couch contrasts the specific characters of *A. stirynchus* with those of a supposed new species, in which the raised margin of the rostrum is 'festooned or lobulated,' the hand is unarmed on every part instead of having a row of spines on its outer surface, the movable finger is deeply furrowed externally instead of being smooth, the telson is quadrangular instead of elongate-triangular, and the first pleon-segment has on its front margin two projections which pass forward and join the margin of the carapace.² But A. M. Norman subsequently decided that this unnamed species was really *A. stirynchus*.³ R. Q. Couch indeed appears to be distinguishing his specimen not from the type but from inadequate or inaccurate descriptions of the type. In these rare sand-burrowing crustaceans the following differences are easy to observe. The *Callianassa* has its first legs chelate and almost extravagantly unequal in size, and the second legs also chelate, but symmetrical with very small chelae. The *Axius*, which Couch calls the 'Slow shrimp,' likewise has the first and second legs fully chelate, but the first pair are not strikingly unequal. In *Upogebia* the second legs are simple, and the first, at least in *U. stellata*, have the fixed finger so much smaller than the movable one that they do not together form a complete chela. Bell is at variance with Leach in attributing a difference in this respect to the doubtful *U. deltäura*, but there are exotic species in which the chela is fully developed, and these are sometimes transferred on that account to a separate genus or sub-genus *Gebiopsis*.⁴ The title of 'Burying shrimp' which Couch applies to the *Callianassa* would equally well suit all these burrowers. It does not appear that like 'burying beetles' they entomb alien bodies, but only that they excavate tunnels in the sand for the purposes of their own life.

The tribe Scyllaridea is divided into two families sharply distinguished by the second antennae, which are short and laminar in the Scyllaridae, but long and subcylindrical in the Palinuridae. To the former no doubt Borlase is referring when he says: 'That fine shrimp, *Squilla lata Rondeletii* (lib. 18, chap. 6), *rubra, albo maculata*, I found on Careg Killas in Mount's Bay.'⁵ Under *Scyllarus arctus* (Linn.), 'The Broad lobster,' Adam White says, 'Pennant records this as having been found by Dr. Borlase on Careg Killas, in Mount's Bay, Cornwall, and a specimen, procured in Cornwall in 1856, was sent to Sir Wm. Jardine, Bart.'⁶ Under the same designation Mr. G. B. Sowerby in his continuation of Leach,⁷ remarks: 'The name of this curious crustacean was first added to our list of British fauna by Dr. Borlase, who found specimens in Mount's Bay, Cornwall. They have also been not unfrequently taken on other parts of our coasts. The more usual order in decapodous crustacea is reversed in this case, the first pair of legs being single-clawed, and the last weakly double-clawed.' Spence Bate in 1878 sums up the account given by the British Association Committee in 1867 as follows: 'Several specimens of this very interesting animal have been taken of late, one of which was at Polperro, and Mr. Couch had the honour of announcing its first addition to the British fauna. Since then it has been taken by Mr. Cornish at Penzance, and at Plymouth near the entrance of the Sound. Two of these were pregnant with spawn. Two also were taken in the stomach of a cod-fish. Those that I have seen were about four inches long. The zoea of *Scyllarus*, according to Anton Dohrn [Dohrn], are *Phyllosoma*.'⁸ It is probable that all our authorities are referring to the same species now known as *Arctus ursus*, Dana, which differs in many respects from the vastly larger *Scyllarus latus* (Rondelet), as determined by Latreille. If Couch and Borlase refer to the same species, Bate must be wrong in saying that Couch had the honour of announcing its first addition to the British fauna, and, whether the specific name ought to be *arctus* or *ursus*, Sowerby cannot be right in saying that the name was

¹ *Fauna*, p. 77.

² *The Zoologist* (1856), vol. xiv, p. 5282.

³ *Ann. Nat. Hist.* (1868), ser. 4, vol. ii, p. 177.

⁴ For a full discussion of this point, see *Marine Investigations of South Africa* (1900), S.A. Crustacea, p. 42.

⁵ *The Nat. Hist. of Cornw.* p. 274.

⁶ *Pop. Hist. Brit. Crustacea*, p. 91.

⁷ *Mal. Pod. Brit.* (1875), text to Plate XXXIV.

⁸ 'Revision,' p. 30.

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first added to our list by Borlase, since he calls it *Squilla lata*. The character which Sowerby mentions, that in this form the hindmost legs are chelate, applies only to the female sex.

Palinurus vulgaris, Latreille, is as common as *Arctus ursus* is rare. It has had various local names. Borlase calls it the 'Long oyster,' Leach the 'Thorny lobster,' Jonathan Couch the 'Craw fish' or 'Red crab.' Its frequent occurrence in Cornish waters is vouched for by J. Couch and Cocks, and R. Q. Couch when discussing the metamorphoses of the Crustacea says: 'The fishermen also abundantly supplied me with gravid specimens of this species.'¹ He was thereby enabled to describe and figure the first stage of this crustacean. At a later date both he and his father discussed the Phyllosoma-stage of *Palinurus*.² But their work has now chiefly historical interest.³

In the Astacidea the family Nephropsidae is represented here by the Common Lobster, *Astacus gammarus* (Linn.) to which Borlase had applied an even more appropriate name in the very year, 1758, which is now accepted as the starting point for priority in zoological nomenclature. Under his section XII, 'Of Shell-fish,' he is evidently comparing the common 'craw-fish' and the common lobster when he writes: 'Besides the muscle, limpet, cockle, wrinkle, and crabs of all kinds, for better nourishment we have the long-oyster (*the Locusta marina Aldrovand. de Crustat. chap. 2 tab. 2*), and the lobster, or *Astacus verus*, much superior in delicacy of food to the former, and in such plenty on the coasts of Cornwall, that well-boats come to load, and carry them alive to London and elsewhere.'⁴ He adds a tantalizing footnote, that, 'in the spring and summer season the largest are bought for fourpence each, sometimes less, in Mount's Bay.' To the scanty notes on Crustacea thus far extracted from his pages a lively addition can here be made. After explaining the wonderful force with which an oyster is able to close its valves and keep them shut, he continues, 'and (as I have been informed by a clergyman of great veracity, who had the statement from a creditable eye-witness to the fact) its enemies have a skill imparted to them to counteract this great force. As he was fishing one day a fisherman observed a lobster to attempt an oyster several times, but as soon as the lobster approached, the oyster shut his shell; at length the lobster, having waited with great attention till the oyster opened again, made a shift to throw a stone between the gaping shells, sprung upon its prey and devoured it.'⁵ How much of its charm would natural history lose without the assistance of voracious clergymen, creditable eye-witnesses, and fishermen—the last above all being noted for a sort of exquisite accuracy in relating the incidents of sport! Yet one cannot help remarking that precisely the same story was told many hundreds of years ago concerning very different actors. In the first edition it is not a clumsy-fingered lobster that so adroitly pitches a pebble between the valves of a gaping oyster, but the ingenious little Pinnotheres that plays this trick upon the comparatively gigantic Pinna. In the modern aquarium curators should by all means provide sightseers with opportunities for witnessing these displays of strategic sagacity, nor must it be forgotten that the nimble stomach of the starfish has well-attested success in oyster-opening.⁶ Under the various names of *Homarus vulgaris*, *H. gammarus*, and *H. marinus*, Couch, Cocks, and Bate speak of the lobster as frequenting Cornish waters. Adam White and G. B. Sowerby correctly name it *Astacus gammarus*. Bate is probably right in saying that it would be 'desirable as much as possible to discourage the destruction of lobsters while bearing spawn: the loss of one lobster in berry is the destruction of some 60,000 to 100,000 young animals of the same kind.'⁷ It should, however, be remembered that the mother and brood which man has spared may be swallowed at one gulp by a conger, and that in any case an average of two mature survivors out of the swarm which each prolific pair is capable of producing will suffice to keep the number of parental lobsters from diminution. In 1880 Bate instituted a new species under the name *Nephropsis cornubiensis*,⁸ but this he subsequently recognized as a young form of the common lobster.⁹

The freshwater crayfish, *Potamobius pallipes* (Lereboullet), belonging to the family Potamobiidae, has not hitherto been recorded from Cornwall. Borlase says: 'In our Cornish rivers we have not the jack, perch, carp, crayfish, or others with which Providence has stocked the rivers in the more inland parts of Britain, as it were to make amends for their being so distant from the much greater variety of sea-fish.'¹⁰ Although the crayfish and crawfish are undoubtedly named by alternative spellings of the same word, Borlase, as we see, groups the former with true fishes and the latter with molluscs or shell fishes. The freshwater crayfish and the saltwater crawfish are not far apart in their organization, but Borlase thought of the latter as the 'long oyster' and classified it accordingly. R. Q. Couch in 1843 says that, when beginning his researches into the transformations undergone by young

¹ *Cornw. Soc.* (1843), p. 37.

² See *Brit. Assoc. Rep.* for 1857 and *Journ. Linn. Soc.* for 1858.

³ See J. T. Cunningham, 'On the development of *Palinurus vulgaris*, the Rock-Lobster or Sea Crayfish, in *Journ. Mar. Biol. Assoc.* (1891-92), vol. ii (New Ser.), p. 141.

⁴ *Nat. Hist. Cornw.* p. 274.

⁵ *Op. cit.* p. 275.

⁶ *Journ. Mar. Biol. Assoc.* (1895-97), vol. iv (New Ser.), p. 266.

⁷ 'Revision,' p. 34.

⁸ *Brit. Assoc. Rep.* for 1880, p. 160.

⁹ *Challenger Macrura* (1888) *Reports*, vol. xxiv, p. 177.

¹⁰ *Nat. Hist. Cornw.* p. 262.

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crustaceans, he 'went over nearly the same ground as Mr. [Vaughan] Thompson and others, and would have done the same by M. Rathke, but could not, from the river crayfish not being found in our streams.'¹ Mr. Geo. Penrose, writing from the Royal Institution of Cornwall, Truro, 8 June, 1903, says: 'I have been making inquiries about the occurrence of the crayfish in Cornish streams, but have not been able to get any record of it.' Rathke was at first reluctant to believe in the metamorphoses of crustaceans, because he had found the young crayfish to be at birth very like its parents. But on further research he very candidly acknowledged that the case was exceptional.

The tribe Penaeidea owes its inclusion in the Cornish fauna solely to the industry of Mr. Cocks, who reports '*Penaeus trisulcatus*, Leach.—from stomach of *Morrhua vulgaris*, and *Morrhua aeglefinus*; rare.' This record appears to have been overlooked by all our later authorities. The Mediterranean prawn intended, is more commonly known by the name *P. caramote* (Risso), now identified with the much earlier *P. kerathurus* (Forskål). In this genus the first three pairs of legs are all chelipeds, but the first pair is the shortest and the third the longest, and they carry exopods or outer branches after the manner of the Schizopoda which will be subsequently mentioned.

The Caridea, a tribe including most of the crustaceans commonly known as shrimps and prawns, are exemplified here not only by many of the common species in great abundance, but by several of those that are rare in English waters. For the family Crangonidae it will be convenient to quote the statement by Cocks, who groups together several species under the genus *Crangon* (Fabricius):—

'*Crangon vulgaris*, Fabr.—In pools and sandy shores; very common. — *fasciatus*, Risso.—From the stomach of *Trigla hirundo*; rare. — *spinus*, Leach.—In the stomach of the *Trigla hirundo*, *Trigla lyra*, *G. luscus*: trawl refuse; not uncommon. — *sculptus*, Bell.—In the stomach of the *Trigla hirundo*; rare. — *trispinus*, Hailstone.—Several mutilated specimens from the stomach of the *Trigla lyra*; rare. — *bispinus*, Westwood.—Trawl refuse, stomach of the *Trigla lyra*; rare. —Dr. Vigurs procured a specimen under a stone, Bar Point.'

In this family the first legs are subchelate, the fixed finger being too short to form a proper chela; the last three pairs of legs are simple. In the members of the family present here the second legs are minutely chelate. Couch speaks of *Crangon vulgaris* as the 'Sand Shrimp,' and calls Leach's *Pontophilus spinus* the 'Rough sand shrimp.' He follows Milne-Edwards and is followed by Bate in assigning the latter to the genus *Crangon*, and in supposing it to be the same as *Aegeon cataphractus* (Oliv). Couch says: 'I have possessed only one specimen, which came from the stomach of a fish taken at a depth of from 12 to 15 fathoms.'² Bate says: 'We have taken it frequently among the zoophytes [zoophytes] from six to sixteen fathoms of water.'³ *Pontophilus*, having seven pairs of branchiae, differs thereby from *Crangon* which has only five, and from *Aegeon* which has eight, and *P. spinus* further differs from *Aegeon cataphractus* by having only five rows of teeth on the carapace instead of seven. Leach, after describing the former species, says: 'This curious animal was discovered by C. Prideaux, Esq., amongst some rubbish dredged in the Sound of Plymouth, near the Edystone; a second specimen was afterwards taken off Falmouth, by the late Mr. John Cranch, zoologist to the Congo Expedition.'⁴ Which of the two rather easily confused species may have been taken by the other authorities it is perhaps no longer possible to determine. Under the heading '*Crangon boreas*—Arctic shrimp.—Phipps', Bate says: 'There can be little doubt but that *C. fasciatus* and *C. sculptus* are identical with *C. boreas* of Phipps. I have compared the animals with the description and figures of the respective authors, and feel sure that the variations between the several forms are dependent upon habitat, those of the Arctic and more northern forms having the spines more strongly developed. Found occasionally on stony ground in about 20 fathoms of water.'⁵ Later authorities by no means share Bate's view that these three species are identical. The Arctic shrimp has actually been removed to a separate genus, and the other two are distinguished by Carus under *Aegeon*.⁶ Westwood's *Crangon bispinus* (1835) has been placed successively under the generic names *Pontophilus*, *Cheraphilus*, *Philocheras*. It takes precedence of Kröyer's dwarf shrimp, *Crangon nanus* (1842), with which it has been identified, and should now therefore be known as *Philocheras bispinus* (Westwood).⁷ As to *Crangon trispinus*, Bate says: 'Strictly this is not Cornish,' he himself having only taken it in the neighbouring county. But he overlooks the record from Falmouth. Lastly, the reader may be reminded that the distinguishing dark band across the fourth pleon segment of *Aegeon fasciatus* is found also on *Philocheras neglectus* (Sars).

No one apparently except Jonathan Couch has observed *Autonomaea olivii*, Risso, on the English coast. By Risso the genus is distinguished from *Processa* by having both limbs chelate in the first pair and from *Alpheus* by having the second pair simple instead of chelate. The second antennae are much longer than the body, and Couch no doubt is referring to this feature in calling it

¹ Cornw. Soc. (1843), p. 30.

² 'Revision,' p. 35.

³ 'Revision,' p. 35.

⁴ See *South African Crustaceans* (1900), pt. I, p. 48, where I have wrongly adopted Kröyer's specific name

⁵ *Fauna*, p. 79.

⁶ *Mal. Pod. Brit.* July 1st, 1817, text to Pl. XXXVII^a.

⁷ *Prodr. Faun. Medit.* (1885), p. 483.

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the 'Long-horned shrimp,' for the proper horn or rostrum is quite short, scarcely reaching beyond the eyes. Couch says: 'This species has been hitherto unknown as British, but I have examined several specimens taken from the stomachs of fishes from the depths of 15 or 20 fathoms. Some of them were of larger size than described from the Mediterranean; one, not the largest, measuring 3 inches from snout to tail, with antennae of the length of 5 inches.'¹ According to Risso this still rather mysterious animal is semi-transparent, yellowish, with some reddish tints, the second antennae and the longer of the two flagella in the first antennae whitish, the first legs a fine red above, a clear yellow below. Risso himself identifies it with '*Cancer glaber*, Olivi, *Zool. Adriat.* p. 51. Pl. V, fig. 4.' Milne-Edwards and O. G. Costa agree that Olivi's species is *Pontonia custos* (Forskål), and Costa decides that Olivi's variety represented in fig. 5 is quite a different species from that of his fig. 4, but still not *Autonomaea*. Both Milne-Edwards and O. G. Costa speak of Desmarest as having independently examined the species. That is, I believe, an entire misapprehension. Desmarest adds nothing to Risso, who on his own showing ought to have called his species *glabra*. Neither does Couch add anything, so that we are left alone with Risso, the inaccurate Risso.

To the family Processidae, in which the mandibles are without palp, belongs *Processa canaliculata*, Leach, often called *Nika edulis*, Risso. Under the latter name Cocks reports it from 'Stomach of *Morrhua aeglefinus*, trawl refuse; rare'; and adds, 'Dr. Vigurs procured two living specimens of this rare shrimp, 18 September, 1849, Bar point.' Bate says: 'We have taken it occasionally on stony ground in about 30 fathoms of water.'² With regard to '*Nika Couchii*—Bell, *Stalk-eyed Crust.* p. 278,' Bate remarks: 'We have taken this in the same locality as the other. With all due deference to the ability and acute observation of the author of the work cited, I must insist that this is nothing more than a variety of *N. Edulis*. It was first found by Mr. Couch and sent to Professor Bell, who never saw but this one specimen.'³ Bate's opinion is probably correct. The genus *Processa* is peculiar in having the first pair of legs in general not truly a pair, since one of the couple is chelate and the other simple.

The Alpheidae have a mandibular palp. The genus *Alpheus* exhibits a first pair of legs ill matched in size and shape, but both members chelate. The second pair are also chelate, though on a minute scale. Cocks says of *A. ruber*, Milne-Edwards, 'The first specimen I found in the stomach of the *Gadus morrhua*, November, 1845. From that date to the present year, 1849, I have procured more than fifty specimens, old and young.' Bell says: 'The only two specimens hitherto found were obtained by Mr. Cocks, of Falmouth, who procured them from the stomachs of cod-fish.'⁴ Bate, after referring to Bell, says: 'It has since been taken off the Dodman in thirty fathoms of water. Also in Plymouth Sound. Its more general habitat is on stony ground in about thirty fathoms of water. Its colour salmon, and red at the joints.'⁵ In 1868 Bate reported from shelly ground off the Dodman two specimens of *Alpheus edwardsii*, which, he says, 'we believe to be the first time that this latter species has been recorded as British. We had them alive for several days. Their colour is a brilliant crimson red, *A. ruber* being rather paler and more banded.'⁶ He figures the species, and in 1878 again asserts the capture of *A. edwardsii* off the Dodman, but takes no notice of the evidence which the Rev. A. M. Norman had adduced in 1868 that the species figured by Bate was in reality *A. megacheles* (Hailstone).⁷ From this, Norman says, '*A. ruber* may at once be distinguished by the four longitudinal carinae of the larger and greatly flattened hand.' He further notices that three Cornish specimens of *A. ruber* in his collection have the right cheliped the larger, and that *Cryptophtalmus ruber* of Costa is unquestionably a synonym of *A. megacheles*, not of *A. ruber*. Bate, in supposing his erroneous record of *A. edwardsii* to be the first entry of that name in the British fauna, overlooked a paper by J. Couch 'On the discovery of *Alpheus Edwardsii* on the Coast of Cornwall.'⁸ Therein Couch mentions two specimens found in the sponge, *Halichondria palmata*, hooked up from a depth of thirty fathoms. After dislodgment from the sponge the Crustaceans were plunged in a bowl of sea water. 'The larger of the two was about nine-tenths of an inch in length from the rostrum to the tail, but although of such small size they traversed the vessel with an apparently threatening aspect, carrying the larger claw aloft, and especially when irritated, snapping it hard, with such vigour as to be heard over a room of moderate size. The sound resembled, as well in kind as strength, the cracking of a filbert nut, and was reproduced as often as the little creature was irritated.' He describes the colour of the larger example a beautiful reddish orange, dark in the region of the stomach; of the smaller specimen pale white. But neither did this *A. edwardsii* stand the test of critical examination by Norman, who showed that it was not an *Alpheus* but the *Typton spongicola* of Costa. The *Typton spongiosus*, described by Bate in 1868, and which as *T. spongiosum* he upholds in 1878, saying, 'Several specimens of this species were found inhabiting a sponge in

¹ *Fauna*, p. 79.

² 'Revision,' p. 36.

³ *Ibid.*

⁴ *Brit. stalk-eyed Crust.* p. 271.

⁵ 'Revision,' p. 37.

⁶ *Brit. Assoc. Report for 1867*, p. 283, and *Ann. Nat. Hist.* (1868), Ser. 4, vol. ii, p. 119.

⁷ *Ann. Nat. Hist.* (Ser. 4), vol. ii, p. 175.

⁸ *Journ. Linn. Soc. Zoology* (1861), p. 210.

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about four fathoms of water, on stony ground off Plymouth Sound,¹ is no doubt Costa's *T. spongicola*. This identification, as Bate acknowledges, was made by Norman in 1868. The name *Typton*, meaning 'the striker,' was given by Costa in allusion to the snapping noise which the creature makes, and which attracted Couch's attention also. This genus has the mandibles without palp, the scale of the second antennae rudimentary, the first legs minutely chelate, the second pair also chelate but large and very unequal. It belongs to the family Pontoniidae.² There is, however, still to be mentioned in the Alpheidae the species *Athanas nitescens* of Leach, who says that it 'is occasionally found in pools left by the tide amongst the rocks on the coasts of Devon and Cornwall.'³ As it is not mentioned by Couch, Bell infers its rarity in the latter county, he being unaware of the industrious researches of Cocks, who reports it 'In ponds, under stones, etc., Gwyllyn-vase, Bar point, Swanpool, etc.; very common. Var: equally common.' This very small species is distinguished from *Alpheus* by having a well-developed rostrum, and the eye stalks only partially covered by the carapace.

To the family Hippolytidae belong *Hippolyte varians*, Leach, *H. prideauxiana*, Leach, and *Spirontocaris cranchii* (Leach). For the presence of the first in Cornwall we have the authority of Leach, Bell, and Bate, of Couch for the third, and of Cocks for all three. Bate in 1866 and 1878 referred the first to a genus *Caradina* [*Caridina* intended], and added a species which he variously called *C. tenuis*⁴ and *C. tenuirostra*.⁵ Subsequently he restored the former to *Hippolyte*, of which it is the type species, and apparently relinquished his *C. tenuis* altogether. *Hippolyte Mitchellii*, W. Thompson, is mentioned by Adam White as found at Falmouth by Norman. The latter in his *Museum Normanianum* (1886) makes it a synonym of *H. viridis* (Otto). The rostrum is toothless above⁶ as in *H. prideauxiana*, with which it may be identical.

In the Pandalidae *Pandalus montagui*, Leach, is mentioned by Couch as the 'long-snouted shrimp,' in evident allusion to its powerful rostrum. Cocks found it in 'trawl refuse, stomach of the *Gadus aeglefinus*, and *Trigla lyra*; rare,' whereas Couch says it is 'common in crab boats,' and adds: 'There appear to be two other species of this minute genus on our coasts, which I have been accustomed to call 'Aesop shrimps,' from their habit of bending up the back into a hump; but further observation is necessary to decide whether they are known to naturalists.'⁷ *P. montagui* attains a length of 2½ in. or more, so that Couch's intention in speaking of the genus as minute is obscure; nor is Bell quite accurate in stating that Couch gives the expressive name of 'Aesop shrimp' to this species in particular. Bate⁸ decides that one of the species which the Cornish naturalist forebore to name is *Pandalus thompsoni*, previously called *Hippolyte thompsoni* by Bell, and later *Pandalus jeffreysii* by Bate, then identified with *Pandalus brevis* (Rathke) by Heller, and finally transferred by Calman to a new genus as *Pandalina brevis* (Rathke). In the new genus the rostrum is much shorter than the carapace instead of longer.⁹

The family Palaemonidae agrees with the Pontoniidae above mentioned, and differs from the Pandalidae by having the 'wrist' or antepenultimate joint in the second pair of legs not subdivided. It contains that graceful creature, the 'common prawn,' *Leander serratus* (Pennant), also *L. squilla* (Linn.), called by Couch the 'Shrimp prawn,' probably on account of its inferior size, and *Palaemonetes varians* (Leach), capable of living either in fresh water or salt. The last is recorded by Cocks 'In pond near Mr. Symon's timber-yard, Bar; scarce.' Of the other two species he reports the first as common and the second as not uncommon.

The Schizopoda, or cleft-legged crustaceans, have the limbs of the trunk furnished with exopods or outer branches adapted for swimming. The family Euphausiidae, in which the arborescent branchiae are exposed to view, is represented in Cornwall by *Nyctiphanes couchii* (Bell). Couch, in writing to Bell about this species, says: 'There were myriads in the stomachs of the mackerel at the time when I obtained those which I sent you.'¹⁰ He explains that the fish were taken almost in mid-channel. Bell, in dedicating the species to his friend, does not specify whether he is honouring Jonathan Couch or his son. Bate in 1878 appears to think that the former is intended, and adds on his own account: 'We have since procured specimens near the coast, but only one or two.'¹¹ Norman reports it from 'Polperro, Cornwall, stomachs of mackerel (R. I. [Q]. Couch); Cornish coast, 1881 (Dr. Day); Polperro (W. Laughrin).'¹²

The Mysidae are distinguished from the Euphausiidae by having no true branchiae. Couch is apparently the first to mention their occurrence in Cornwall. He names *Mysis spinulosus*, Leach, and says: 'There are other species, as well as the nearly allied Genus *Cynthia*, on our coast; but

¹ 'Revision,' p. 37.

² See Borradaile, *Ann. Nat. Hist.* (1898), Ser. 7, vol. ii, p. 376.

³ *Malac. Podophth. Brit.* (1817), text to Pl. XLIV.

⁴ *Ann. Nat. Hist.* (1866), Ser. 3, vol. xvii, 28.

⁵ *Pop. Hist. Brit. Crust.* p. 120.

⁶ 'Revision,' p. 39.

⁷ 'Revision,' p. 38.

⁸ *Fauna*, p. 79.

⁹ *Ann. Nat. Hist.* (1899), Ser. 7, vol. iii, 39.

¹⁰ *Brit. Stalk-eyed Crustacea*, p. 347, on *Thysanopoda Couchii*.

¹¹ 'Revision,' p. 41.

¹² *Ann. Nat. Hist.* (1892), Ser. 6, vol. ix, 460.

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they are here omitted for want of a recent opportunity for comparison.¹ He explains that the English title of 'Opossum shrimps' applied to Schizopods is due to their 'habit of carrying the eggs in a receptacle under the thorax until they are hatched, as in the analogous genus of Quadrupeds, the Opossum tribe.' This connexion of the eggs with the peraeon or thorax, instead of with the pleon or abdomen, is normal in the sessile-eyed Malacostraca. Cocks records *M. spinulosus* 'In ponds, Bar point, Gwyllyn-vase, Swanpool, Helford, Bream Bay, Pendower, St. Ives; not uncommon.' Bate records the same species as *M. chameleon*, Bell having earlier identified it with Vaughan Thompson's *M. chameleon*. But these names of this very common species have to yield to the earlier *Praunus flexuosus* (O. F. Müller). Concerning *M. griffithsia*, Bell, Bate remarks: 'We have taken this supposed species, but I feel assured that it is only the younger stage of a macrurous form, probably *Palaemon* or *Crangon*, the young of either genus of which it closely approximates.'² This hypothesis, however, must be dismissed as highly improbable, and at any rate it has hitherto met with no adherents. The species in question has rather been considered equivalent to *Siriella armata* (Milne-Edwards), and for this the correct name will be *S. rostrata* (Guérin) if Bell and Norman are right in supposing Guérin's figure to represent Milne-Edwards's species.³

In 1856 R. Q. Couch described from Mount's Bay two species, *Mysis oberon* and *Mysis lamornae*.⁴ The latter of these is now referred to the genus *Hemimysis* (Sars), distinguished from *Siriella* by having the apex of the telson cleft instead of entire. The species is pellucid, but having the carapace bright red or orange, and some other parts flecked with the same colour. It is recorded from Falmouth also by Dr. Norman, who in his otherwise very complete revision of the British Schizopoda does not take notice of *M. oberon*. Couch describes this as having the rostrum bluntly triangular, reaching as far as the circumference of the cornea, the telson lanceolate, rounded at the apex, the rounded portion with two diverging teeth; 'a perfectly transparent species, the large black eyes being the chief points by which it can be detected.' It must certainly, I think, be a *Siriella*, and but for the bluntness imputed to the rostrum might be regarded as anticipating *S. jaltensis*, Czerniawski.

Norman records *Macropsis slabberi* (van Beneden) from Falmouth on the authority of Mr. G. C. Bourne.⁵ This is a very interesting species, first described and figured by Slabber in 1769 as a shrimp with trumpet-like eyes,⁶ but without any Latin designation. Like *M. oberon* it is pellucid as water, but the rostrum does not nearly reach the cornea of the exceedingly elongate eye-stalks. The telson is short, triangular, with rounded apex, and a tooth at each side where the rounding begins. It is rather singular that White,⁷ who quotes from Couch's description of *M. oberon*, also mentions another translucent form as '*Mysis n. s.*, Plate IX, fig. 4, found, Falmouth (rock pools at), Rev. A. Norman, April, 1855.' Norman himself makes no reference to the brief description and undecipherable figure of this unnamed species. He on his own part reports that *Neomysis vulgaris* (Vaughan Thompson) is 'found all round our coast in brackish water at mouths of rivers, estuaries, salt marshes, and such-like places,'⁸ so that we may safely add it to the fauna of Cornwall. Its genus is distinguished by a long subulate antennal scale and an elongate telson with entire pointed apex. In *Schistomysis* (Norman), the antennal scale is sub-rhomboidal, with the apex much produced beyond the lateral tooth. Two species of this genus, *S. spiritus*, Norman,⁹ and *S. arenosa* (Sars)¹⁰ are reported by Garstang from Whitsand Bay, and from the same locality *Gastrosaccus sanctus* (van Beneden).¹¹ *Gastrosaccus* being a preoccupied name, the last species must now be called *Acanthocaris sancta*.

The Stomatopoda, as now restricted to the single family of the Squillidae, have the last three pairs of legs two-branched. In other respects they are very unlike the Schizopoda, with which they were for a long time rather absurdly combined. Couch mentions *Squilla desmarestii*, Risso, as rare,¹² and Bell adds *S. mantis*, Rondelet,¹³ ending his description with the remark: 'Mr. Couch, to whom I am indebted for the specimen above referred to, informs me that the Squillae were brought from the distance of about a couple of leagues, where the bottom is rocky, with some spots of sand.' In this species the great prehensile claw formed by the second maxilliped has six teeth on the finger and the pleon has eight carinae or crests, while the smaller *S. desmarestii* has only five teeth on the clasping finger and its pleon is smooth along the middle of the back, being content on its first five

¹ *Fauna*, pp. 80, 81.

² 'Revision,' p. 40.

³ Compare Norman, *Ann. Nat. Hist.* (1892), Ser. 6, vol. x, pp. 151, 263, and Guérin's *Iconographie*, Crustacés, Pl. XXIII, fig. 2; *Explication*, pp. 16, 17 (the plate being earlier, the explanation later than 1837, the date of *S. armata*).

⁴ *Zoologist*, vol. xiv, pp. 5284, 5286.

⁵ *Ann. Nat. Hist.* (1892), Ser. 6, vol. x, 250.

⁶ *Naturkundige Verlostingen*, p. 136, Pl. XV, figs. 3, 4.

⁷ *Pop. Hist. Brit. Crust.* p. 145.

⁸ *Journ. Mar. Biol. Assoc.* (1891-92), vol. ii, N.S. 331.

⁹ *Ibid.* (1893-95), vol. iii, 221.

¹⁰ *Fauna*, p. 81.

¹¹ *Ibid.* vol. ii, 331.

¹² *Brit. Stalk-eyed Crustacea*, p. 353.

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segments with four carinae. The eyes and first antennae in this family are borne on movable segments. The rostrum is articulated. The principal branchiae are attached to the pleopods.

Before leaving the stalk-eyed Malacostraca the reader will no doubt welcome a quotation from Jonathan Couch's *History of the Fishes of the British Islands*,¹ in which a discussion of the cod's voracity includes an interesting contribution to our present subject. After mentioning several strange miscellanea of its diet Couch continues:—

'In one instance six Picked Dogfishes, each 9 in. in length, were found in the stomach of a cod; and the following list of crustacean animals (crab and lobster kinds) in the stomach of these fishes, which were taken in the west portion of the British Channel, will show the strong preference which the cod manifests for that sort of food, of which also, we may add, their digestion is so powerful and speedy, that, in a short time after being swallowed, the hard and brittle crust of the crabs is made so soft by the action of the gastric juice, that their legs may be twisted round the finger.

'*Crabs*.—*Stenorynchus phalangium*, *Achaeus Cranchii*, *Inachus Dorsettensis*, *I. dorynchus*, *I. leptochirus*, *Hyas coarctatus*, *Eurynome aspera*, *Xantho tuberculata*, *Cancer pagurus*, *Portunus corrugatus*, *P. arcuatus*, *P. marmoreus*, *P. pusillus*, *P. longipes*, *Gonoplax angulatus*, *Atelecyclus heterodon*, *Corystes cassivelaunus*, *Pagurus Bernhardus*.

'*Long-tailed Crustaceans, lobster kind*.—*Galathea squamifera*, *G. strigosa*, *G. dispersa*, *G. Andrewsii*, *Munida Rondeletii*, *Gebia stellata*, *G. deltura*, *Nika edulis*, *N. Couchii*, *Squilla Desmarestii*, *Alpheus ruber*, *Scyllarus arctus*.

'In this enumeration the notes of Mr. W. Laughrin, A.L.S., are united with my own; and of these species the *Scyllarus arctus* offered only one example, which is now deposited in the British Museum; but of the *Munida Rondeletii*, which is usually considered as not a common species, there have been found not only numerous specimens, but these have often been of remarkable size. The longest leg of an example described by Mr. Bell in his beautiful *Natural History* of this tribe measured 6 in., but I have found the same part to measure 9 in., with the antennae of the same length as the leg.'

Under the alternative names of *Gadus morrhua* and *Morrhua vulgaris*, the cod has been shown also by Mr. Cocks to have a thoroughly carcinophilous palate, which it shares with the haddock, the piper, the tubfish—and many other gourmands.

The transition to the sessile-eyed Malacostraca is not abrupt, since there is a small peculiar group in which the eyes are sessile, but the affinities are nearer to the Podophthalma. To this order, for some time known as the Cumacea, the name Sympoda has lately been applied.² Hitherto only two species appear to have been noted from Cornish waters, though many more will certainly be found therein when sought for with moderate diligence. Of *Diastylis rathkii* (Kröyer) Bate says 'It was first taken in Cornwall, at St. Ives, by the late Mr. Barlee. From Falmouth I received it from Mr. Webster.' He reports his own species *Eudorella truncatula* (Bate) from Plymouth Sound.³ In the former genus there is a very distinct telson, in the latter there is none.

The other sessile-eyed orders, Isopoda and Amphipoda, though disregarded in Couch's *Cornish Fauna*, not much later were collected with some diligence by Cocks, and in due course attracted the notice of Couch and his son, and eventually, through the well-known work of Bate and Westwood, to which Norman and others lent powerful assistance, they began to assume an important place in the natural history of Great Britain. The economic value of little crustaceans is perhaps seldom appreciated. Out of the multitude of aquatic animals we only use a few species for food, and as a rule trouble ourselves little to consider how those animals themselves are nourished. But, if, as above noticed, large fishes eat the larger crustaceans, small fishes eat the smaller, and just as the strong mammals prey upon the weaker, so are the jaws of one shrimp nicely adapted for masticating another. By a circuitous route the microscopic organisms of this class almost undoubtedly render to mankind such services as our noblest philanthropists cannot hope to emulate.

The genuine Isopoda, like the Squillidae, have the breathing organs in the pleon, but there is a tribe of anomalous Isopods which have their respiratory arrangement in the front or cephalo-thoracic part of the structure. This tribe is sometimes called Tanaidacea, sometimes Chelifera. It comprises two families, the Tanaidae and Apseudidae. In these the heart is placed near the head, as in the Amphipoda, instead of near the tail, as in other Isopoda. The first legs are chelipeds, as in crabs and lobsters, but here there are seven pairs of trunk-legs instead of five, so that the first pair correspond not with the chelipeds of a crab but with its second maxillipeds. Of the Tanaidae, Bate and Westwood describe *Tanais vittatus* (Rathke) and *T. dulongii* (Audouin) from Polperro, and *Paratanais forcipatus* (Lilljeborg)⁴ from Plymouth Sound. Although the English

¹ Op. cit. (1864), vol. iii, 55.

² Stebbing, in Willey's *Zoological Results* (1900, part v, p. 606), and *Encyclopaedia Britannica* Suppl. (1902), Art. Malacostraca.

³ 'Revision,' pp. 41, 42.

⁴ *British Sess. Crust.* vol. ii, pp. 125, 129, 138.

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authors profess to have but little hesitation in referring their specimens of the first species to the earlier *T. cavolinii*, Milne-Edwards and Audouin, they left it for Adrien Dollfus to restore that name in 1897.¹ They received 'a considerable number of individuals captured by Mr. Laughrin, at Polperro,' who, they say, 'informs us that they live gregariously below high-water mark, where they protect their small colony by retiring deeply within the fissures of the slaty rocks of the coast, where they collect a mass of material of a "leathery consistency" behind or within which they take shelter. When disturbed they escape and will spring to a considerable distance. This is probably done by bringing the head and tail together and suddenly straightening themselves.' I cannot remember ever having seen such gymnastics on the part of specimens which have been extracted from their pile-dwellings along with *Limnoria lignorum* and *Chelura terebrans*. The doubts which Bate and Westwood have themselves raised about their second species are not yet solved. Their third species is distinguished by Sars in 1880 under the name *Paratanais batei*.² Norman took it in Falmouth Harbour in 1884.³ In *Tanais* there are only three pairs of pleopods and the uropods have only one branch; in *Paratanais* there are five pairs of pleopods and the uropods have two branches. *Leptochelia* in these respects agrees with *Paratanais*, but unlike that genus it has more than two joints to the inner branch of the uropods, and in the male the chelipeds attain extraordinary length. Norman reports *L. dubia* (Kröyer) from Falmouth Harbour.⁴ Of the Apseudidae we have *Apseudes talpa* (Montagu) reported by Cocks from 'Trawl refuse; in crevices of stones, shells, etc.; Gwyllyn-vase: rare.' Bate has taken it in Plymouth Sound.⁵ In this genus there is a well-developed 'scale' on the second antennae and exopods on the gnathopods—that is, on the first and second pairs of trunk-legs.

The next tribe, called Flabellifera from the flabellum or fan formed by the terminal segment and uropods, comprises several important families. Of the Anthuridae the linear *Anthura gracilis* (Montagu) is reported by Cocks from 'Trawl refuse, Gwyllyn-vase; scarce,' and by Bate and Westwood as having been taken by Mr. Barlee, also at Falmouth.⁶ In the Gnathiidae, Cocks, using for that family the now discarded name Pranizidae, reports '*Praniza caeruleata*, Desm.—not uncommon,—*fuscata*, Johnston.—Not uncommon,' and '*Anceus maxillaris*, Mont.—Gwyllyn-vase, etc.—rare.' Bate and Westwood say, 'Mr. W. P. Cocks found the males in crevices of rocks at extreme low-water mark at Gwyllyn-Vase, and in trawl refuse, whilst the Pranizae he took most abundantly in the neighbourhood of Falmouth, and a specimen in the British Museum, labelled *P. flavus*, Bantham, Falmouth, is undoubtedly a female of this species.'⁷ Why they discriminate between Gwyllyn-vase and the neighbourhood of Falmouth is not made known. Probably the three supposed species were all taken at the same locality and alike belong to *Gnathia maxillaris* (Montagu). In this genus the young and the females differ so strikingly from the adult males that their generic separation was excusable. The honour of detecting the mistake is due to Monsieur Eugène Hesse, as Bate was well aware, though in his 'Revision' he allows the printers to call him M. Hepe.⁸ The colour in the young is said to vary very remarkably. Montagu describes individuals of a bright blue. Bate and Westwood say, 'We have received them of a bright grass green from Mr. Loughrin, of Polperro: blue from the crevices in the slate in Plymouth Sound, and have dredged them of an ash-grey, as well as transparent and white, in five or six fathoms of water in the same locality.'⁹

The Cymothoid group of families is very extensive and is especially distinguished for the unscrupulous voracity which several of its members display. Of the Eurydicidae three species are known in these waters. Concerning *Cirolana cranchii*, Leach, Bate and Westwood say that 'the original specimens of this species were forwarded to Dr. Leach from Falmouth (Cornwall) by Mr. J. Cranch.'¹⁰ Cocks found it 'in dredger's refuse from harbour, and Gwyllyn-vase bay: not common.' Bate in his 'Revision'¹¹ does not mention this species, but instead introduces *Coriolana spinipes*. This is a complication of blunders, for there is no such genus as *Coriolana*, and the *Cirolana spinipes* of Bate and Westwood, which is a synonym of *C. borealis*, Lilljeborg, was not 'taken at Falmouth by Dr. Leach and Mr. Cranch,' as Bate affirms it to have been, while his further statement that he himself had dredged it in Plymouth Sound is obviously transferred from his earlier notice of *C. cranchii*. From the last-mentioned species, *Conilera cylindracea* (Montagu) is generically separated by having the first pleopods hardened to constitute an operculum. Cocks obtained it from 'Trawl and dredger's refuse, Harbour, &c.'; Bate by dredging in the Sound and through Mr. Loughrin from Polperro.¹² *Eurydice achata* (Slabber), often called *E. pulchra*, Leach, is said by Bate to be 'taken in pools on the coast.'¹³ The genus of this pretty but savage little animal, unlike the two preceding genera, has no hooks on the second joint of the

¹ Bull. Soc. Zool. France (1897), p. 207.

² Ann. Nat. Hist. (1899), Ser. 7, vol. iii, p. 335.

³ Brit. Sess. Crust. vol. ii, p. 152.

⁴ Brit. Sess. Crust. vol. ii, p. 195.

⁵ Brit. Sess. Crust. vol. ii, p. 194.

⁶ Op. cit. p. 65.

⁷ Brit. Sess. Crust. vol. ii, p. 306.

⁸ Crustacea of Norway (1896), vol. ii, pt. 1, p. 16.

⁹ Ibid. p. 334.

¹⁰ Ibid. p. 162.

¹¹ Op. cit. pp. 64, 65.

¹² Ibid. p. 298.

¹³ 'Revision,' p. 66.

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maxillipeds. In the family Aegidae, Cornwall has two species known. The characters of *Rocinela danmoniensis*, established by Leach in 1818, were first rescued from obscurity by Bate and Westwood, but since Cocks in 1850 records it from 'Trawl and dredger's refuse,' Bate is not quite accurate in saying, 'This for half a century was known only by one specimen in the British Museum, named by Dr. Leach.'¹ He and his colleague say, 'We have received it from Polperro, where it was taken by Mr. Loughrin.'² I myself am indebted to Mr. Rupert Vallentin for a specimen taken off a mackerel at Falmouth. The species which Bate and Westwood call *Aega bicarinata*, Leach, labours under some obscurity. They give for it a North of England locality, resting on a specimen now known to be *Aega strömii*, Lütken. This has been thought to throw some doubt on the name which they apply to their Plymouth specimen.³ In any case *Aega rosacea* (Risso) takes precedence of *Ae. bicarinata*.⁴ The emarginate telson separates both this and *Ae. strömii* from *R. danmoniensis* in which the telson is rounded. Also in *Rocinela* the maxillipeds are four-jointed, but six or seven jointed in *Aega*.

The family Sphaeromidae has several Cornish genera. Cocks names *Sphaeroma serratum*, Fabricius, from 'Under stones, &c., Gwyllyn-vase, &c.' Bate adds *S. rugicauda*, Leach, which he transmutes into *rugicandata*, saying, 'In Cornwall we have found it at the mouth of the River Tamar.'⁵ *Naesa bidentata* (Adams) was found by Cocks 'Under stones, in crevices of rock &c., Gwyllyn-vase: not uncommon.' Bate and Westwood note it as 'common amongst weed between tides on the rocky shores' of Cornwall, and as found at Polperro by Mr. J. Couch. They say, 'It is generally associated with *Dynamene Montagu*, of which we think it may possibly turn out to be the male.'⁶ Leach's three species *D. montagu*, *D. rubra*, and *D. viridis* are pretty constant companions of *N. bidentata*, and are probably not fully adult forms of that species, now called *Dynamene bidentata* (Adams). Cocks records *rubra* and *viridis*, which are mere colour varieties, under the genus *Cymodocea*, more properly called *Cymodoce*. He found Leach's two species *C. truncata* and *C. emarginata* 'in crevices of rocks, &c., Gwyllyn-vase.' Of the latter Bate and Westwood say 'Mr. John Cranch found specimens, less strongly granulose, at Falmouth.'⁷ Should the two named species be united *C. truncata* has priority. *Campecopea hirsuta* (Montagu) is reported by Cocks from 'Trawl refuse, extreme low-water mark, Gwyllyn-vase: very rare,' but by Bate as taken in some profusion 'at Polperro, among the small dry *fuci* that exist on the surface of the rocks within reach of the spray of the sea, but where the sun appears to drain off all moisture.' Bate adds *C. cranchii*, Leach, as 'Found with the preceding, and is probably the female. Taken at Falmouth as well as plentifully mingled with the former species in the localities named.'⁸ There can be no doubt that *C. cranchii* is the female of *C. hirsuta*. The fucus described by Bate is the *Lichina pygmaea*, of which these little crustaceans might easily be thought to be constituents.

The family Limnoriidae presents the wood-boring Gribble, *Limnoria lignorum* (J. Rathke). Under the later name *L. terebrans*, Leach, Cocks reports it from 'Gwyllyn-vase, Penzance, etc.: not common.' Bate has knowledge of it 'all round our coast, in submarine timber, which it eats with avidity.'⁹

The tribe of the Valvifera includes two families, the Astacillidae and Idoteidae. In both of these the pair of ventrally placed valves that open and shut upon the pleopods are in reality the uropods or terminal appendages, though their position dissembles the fact, and has a great tendency to mystify the observer. *Astacilla longicornis* (Sowerby), formerly placed in the genus *Arcturus*, is recorded by Cocks from 'Trawl refuse: not uncommon.' The great length of the fourth peraeon-segment is a striking feature in this genus. The marsupium of the female consists of two plates, whereas in *Arcturus* it is composed of four. *Idotea balthica* (Pallas), *I. pelagica*, Leach, *I. emarginata*, Fabricius, and *I. linearis* (Linn.), are all attested as Cornish by Bate,¹⁰ and the last two also by Cocks. The first and commonest of the four has had many designations, of which *I. tricuspidata* has had the greatest vogue. *I. neglecta*, Sars, has recently been recorded by Norman from Falmouth. As to the round-ended *Zenobiana prismatica* (Risso), Bate and Westwood, who call it *Idotea parallela*, say, 'We have obtained this species from Falmouth, taken by Mr. Barlee, and from Polperro whence it was sent to us by Mr. Loughrin.'¹¹ *Stenosoma acuminatum*, Leach, is recorded by Cocks as an *Idotea*, from 'Castle point, Gwyllyn-vase, East: not uncommon.' Concerning *Idotea appendiculata* (Risso), which perhaps also belongs to *Stenosoma*, Bate and Westwood say, 'We have received it from Mr. Loughrin from Polperro.'¹²

The tribe Asellota and the family Asellidae are alike named from the freshwater genus *Asellus* of Geoffroy, which has the peculiarity that neither the first nor the last of the pleon

¹ 'Revision,' p. 65.

² *Brit. Sess. Crust.* vol. ii, p. 293.

³ *Ibid.* p. 280.

⁴ Schiödte and Meinert, *Naturhist. Tidsskrift* (1879), Ser. 3, vol. xlii, p. 353.

⁵ 'Revision,' p. 69.

⁶ *Brit. Sess. Crust.* vol. ii, p. 432.

⁷ *Ibid.* p. 429.

⁸ 'Revision,' p. 70.

⁹ *Ibid.* p. 67.

¹⁰ *Ibid.* p. 68.

¹¹ *Brit. Sess. Crust.* vol. ii, 392.

¹² *Brit. Sess. Crust.* vol. ii, 397.

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appendages are opercular, but the second pair. *Asellus aquaticus* (Linn.) by the judgement of Cocks and Bate is as common in the ponds and ditches of Cornwall as in those of other counties. The neighbouring family Janiridae consists of marine genera. *Janira maculosa*, Leach, has a small scale or exopod on the second antennae. Bate says of it 'not infrequent on the coast. They have been taken at Falmouth, Polperro, and Plymouth.'¹ Cocks, using the name *Oniscoda maculosa*, Latreille, reports it 'Under stones, algae, etc.: not uncommon.' The two little species *Jaera albifrons*, Leach, and *J. nordmanni*, Rathke, are both recorded by Bate from Plymouth,² and the former by Cocks from 'Gwyllyn-vase, Swanpool, etc.: not uncommon.' Its name according to Sars should be *J. marina* (O. Fabricius), and he is doubtful whether the English authors may not have mistaken the male of this species for Rathke's *J. nordmanni*.³

The tribe of the Epicaridea, isopods parasitic upon other crustaceans, embraces a great number of peculiar forms. As yet only five of the genera have been, it seems, recorded from Cornwall, each in respect to a single species. All five belong to the family Bopyridae. For *Athelgue paguri* (Rathke), Bate and Westwood employ Rathke's name *Phryxus paguri*, and say, 'We have received the male and female of this species from Polperro, collected by Mr. Couch.'⁴ *Pleurocrypta galateae*, Hesse, is said by Giard and Bonnier to be the species which Bate and Westwood figure and describe as *Phryxus longibranchiatus*, remarking 'From Polperro we have received specimens of both sexes captured by Mr. Loughrin upon an old specimen of *Galathea squamifera*, of a much larger size than those represented above, the male being $\frac{1}{2}$ in. and the female $\frac{1}{2}$ in. long.'⁵ Bate in his 'Revision' calls it *Phryxus logibrachitus*. *Ione thoracica* (Montagu) is recorded by Cocks, who unpatriotically attributes the species to Latreille, as 'Found under the carapace of the *Callianassa subterranea*: not uncommon.' To most collectors this is a rare crustacean's rarer parasite. Bate and Westwood describe a species as *Gyge hippolytes* (Kröyer) from Ireland, adding, 'Another specimen (of the female), which appears to us to belong to the same species, and which has supplied the central figure in the above woodcut, was forwarded to us from Polperro by Mr. Loughrin.'⁶ Its host is not mentioned. The genus should perhaps be *Bopyroides* (Stimpson). *Bopyrus squillarum*, Latreille, is recorded by Cocks as 'Found under the carapace of the *Palaemon serratus*: not uncommon.' For *Palaemon* should be read *Leander*. Bate calls this parasite '*Bopyrus squillarius*,' and says, 'Frequently found under the shell of prawns and shrimps. From Polperro and off the coast.'⁷ Whether it is ever, not to say frequently, found on shrimps is extremely doubtful.

The tribe Oniscidea comprises the terrestrial Isopoda commonly called woodlice. The Cornish list is evidently capable of development. In the family Ligiidae is the large shore-frequenting *Ligia oceanica* (Linn.), reported by Cocks as common, and in the Trichoniscidae the little *Trichoniscus pusillus*, Brandt, which Bate and Westwood record from 'Polperro (in the garden of the inn, not uncommon); Looe abundantly, among sticks by the riverside.'⁸ In the Oniscidae, Cocks mentions *Oniscus asellus*, Linn., *Porcellio scaber*, Latreille, and *P. laevis*, Latreille, all as common. Bate and Westwood add the two British species of *Philoscia*, the sylvan *P. muscorum* (Scopoli) and the beach-loving *P. couchii*, Kinahan, of which Bate says, 'It was discovered at Talland Cove, near Polperro, from whence we were returning accompanied by Professor Kinahan, who gives this account of its discovery: 'In returning home we took the cliff road, and at Talland Cove spent a few moments examining the supra-littoral zone (the tide being nearly full in). Here, as might be expected, *Ligia oceanica*, *Porcellio scaber*, *Philoscia muscorum*, and *Orchestia littorea* were abundant; but I was much pleased by also meeting with a *Philoscia* new to me, and also undescribed in the books. This I have named *Philoscia Couchii*, in memorial of one of the pioneers of the zoological geography of England, and of a few pleasant hours spent in his company. The species appeared abundant.'⁹ Lastly in the family Armadillidiidae *Armadillidium vulgare* (Latreille) on the authority of Cocks and Bate is common and very abundant in Cornwall as elsewhere.

In English science the Amphipoda had attracted little attention prior to the efforts of Mr. Spence Bate. The often-quoted work in which he and Westwood were partners was published in twenty-three parts between October, 1861, and December, 1868. Since then knowledge of the subject has greatly advanced, with the usual result that numerous changes of nomenclature have been introduced. The Amphipoda agree with the Isopoda in having the body tripartite, the cephalic portion ending with the maxillipeds, the pereon or trunk comprising seven segments with their limbs, the pleon or tail usually well developed. But this last portion does not as in the Isopoda carry the breathing organs. Its first three segments are furnished with flexible pleopods, its next three with rigid uropods. The branchial vesicles connected with the limbs of the trunk are not enclosed in any chamber, and are generally simple. There are three well-marked divisions of this order, the Caprellidea, in which the pleon is degraded; the Hyperiidea, in which the four

¹ 'Revision,' p. 66.

² *Crust. of Norway* (1897), vol. ii, 104.

³ *Ibid.* vol. ii, 248.

⁴ 'Revision,' p. 64.

⁵ *Ibid.* p. 66.

⁶ *Brit. Sess. Crust.* vol. ii, 242.

⁷ *Ibid.* p. 231.

⁸ *Brit. Sess. Crust.* vol. ii, 457.

⁹ *Ibid.* p. 453.

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terminal joints or so-called 'palps' are absent from the maxillipeds; and the Gammaridea, which agree with the first division in having the palps, and with the second in having the pleon well developed.

The last-named tribe is subdivided into numerous families, of which the following are represented in these waters. The Lysianassidae comprise many genera and species, in which also the difficulties of identification are not few, with the result that a rather large number of the names assigned by Bate have fallen to the ground. In his 'Revision'¹ he mentions *Lysianassa Costae*, Milne-Edwards, *L. audouiniana*, Bate, and *L. atlantica*, Milne-Edwards. For the first it seems that now the name *plumosa*, Boeck, should be accepted; for the second (recorded by Norman from Polperro) *Perrierella audouiniana* (Bate), for the third *Ambasia atlantica* (Milne-Edwards).² *Socarnes erythrophthalmus*, D. Robertson, has been found at Falmouth by Norman.³ From Polperro through Loughrin he obtained Bate's *Scopelochelirus crenatus*, which he identifies with the earlier *Callisoma hopei*, A. Costa.⁴ Norman also reports *Orchomenella nana* (Kröyer) from 'Polperro, Cornwall (Laughrin),'⁵ placing it in the genus *Tryphosa* in opposition to Sars, to whose work he refers, without noticing the substantial reason which that writer adduces for retaining the species in his genus *Orchomenella*.⁶ Under *Anonyx edwardsi* Bate and Westwood say, 'From Falmouth it has been sent us by Mr. Webster and we have dredged it in Plymouth Sound.'⁷ According to Norman the species intended ought to be named *Orchomene humilis* (A. Costa).⁸ As to their *Anonyx holbölli*, Bate and Westwood say, 'Mr. Loughrin has sent us a half-grown specimen, from Polperro, on the coast of Cornwall, and we have dredged it in Plymouth Sound.'⁹ Sars points out that this is not Kröyer's *A. holbölli* but *Hoplonyx cicada* (O. Fabricius).¹⁰ Bate and Westwood report *Anonyx minutus*, Kröyer, as sent to them by Mr. Webster from Falmouth, and as dredged in Plymouth Sound.¹¹ Kröyer's species is referred by Sars to *Orchomenella*, but Norman is disposed to think that Bate and Westwood were really dealing with a young male of *Orchomene humilis* (Costa). 'Both figures and description,' he says, 'accord with *O. humilis*, except the description of the posterior peraeopoda, which description, however, does not accurately apply to any allied form known to me.'¹² *Tryphosa nanoides* (Lilljeborg) was taken at Polperro on a skate by Norman himself.¹³ This and other species of the family have been noted by David Robertson of Cumbrae for their activity as sea-scavengers, the crowd at any particular banquet generally being composed of a single species.¹⁴ Norman makes the comment, 'It is not always so, for I may mention that at Falmouth on a dead fish in a crab-pot I found *Orchomene humilis* and *Socarnes erythrophthalmus* associated in thousands of each species enjoying their dinner in mutual respect.'¹⁵

The family Ampeliscidae in many of its species shows the peculiarity of four eyes externally simple. The species which Bate and Westwood regard as *Ampelisca gaimardi*, Kröyer, is now held to be not Kröyer's species, but Bate's own *A. typica*. They report it from 'off Fowey, taken by Mr. Wells, of the Admiralty Survey,' and add that 'in Plymouth Sound it has been dredged by Mr. T. P. Smyth and ourselves.'¹⁶ *A. belliana* (Bate), also dredged in Plymouth Sound,¹⁷ is now identified by Della Valle with *A. brevicornis* (A. Costa).¹⁸

In the family Haustoriidae stands one of our most beautiful amphipods, the sand-burrowing, sand-furrowing, and sand-coloured *Haustorius arenarius* (Slabber). It is far from uncommon. Its beauty lies principally in the varied equipment of plumose hairs. Bate says, 'I first found this species on the coast of South Wales on sandy shores between the tide marks, but I found afterwards that undescribed specimens had been in the collection of the British Museum, which had been taken by Dr. Leach in the neighbourhood of Falmouth.'¹⁹ Bate records his own *Urothoe elegans*, named from its beautifully variegated colouring when alive, as 'taken from some trawl refuse from the neighbourhood of the Eddystone.'²⁰

Of the Phoxocephalidae Bate dredged in Plymouth Sound *Phoxocephalus holbölli* (Kröyer), and a species which Norman upholds as *P. simplex* (Bate), while A. O. Walker identifies it with the preceding species.²¹ The Leucothoidae are represented by *Leucothoe spinicarpa* (Abildgaard) from

¹ Op. cit. p. 45.

² Compare Norman in *Ann. Nat. Hist.* (1900), Ser. 7, vol. v, 143, 144, 199.

³ Ibid. p. 144.

⁴ Ibid. p. 200.

⁵ Ibid. p. 203.

⁶ *Crust. of Norway*, vol. i, Appendix (1895), p. 683.

⁷ *Brit. Sess. Crust.* vol. i, 97.

⁸ *Ann. Nat. Hist.* Ser. 7, vol. v, 202.

⁹ *Brit. Sess. Crust.* vol. i, 107.

¹⁰ *Crust. of Norway*, vol. i, 93.

¹¹ *Brit. Sess. Crust.* vol. i, 110.

¹² *Ann. Nat. Hist.* Ser. 7, vol. v, 204.

¹³ Ibid. p. 206.

¹⁴ *Trans. Nat. Hist. Soc. Glasgow* (1892) vol. iii, 205.

¹⁵ *Ann. Nat. Hist.* Ser. 7, vol. v, 203.

¹⁶ *Brit. Sess. Crust.* vol. i, 134.

¹⁷ Ibid. p. 137.

¹⁸ Norman, *Ann. Nat. Hist.* Ser. 7, vol. v, 342.

¹⁹ 'Revision,' p. 49.

²⁰ Ibid. p. 48.

²¹ See *Ann. Nat. Hist.* Ser. 6, vol. xvii, 343; vol. xviii, 156; Ser. 7, vol. v, 335.

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Polperro, whence Mr. Loughrin, or Laughrin, sent it to Norman¹ and Spence Bate.² Cocks obtained it from 'trawl refuse, rare.' In the Metopidae the species which Bate described as *Montagua pollexiana*, and of which he says, 'I have had this species dredged off the north coast of Cornwall, near St. Ives,'³ is identified by Norman with the earlier *Metopa norvegica* (Liljeborg). *Montagua monoculoides* (Montagu) 'from Falmouth, Penzance, and Plymouth,'⁴ and *M. marina*, Bate, found 'in the refuse of the trawlers, off the Eddystone,'⁵ now stand in the genus *Stenothoe* (Dana), of the family Stenothoidae. Another small species, *Danaia dubia*, Bate, also 'taken in trawl refuse, off the Eddystone,'⁶ has been transferred to Boeck's genus *Cressa*, of the family Cressidae.

In the Oedicerotidae *Periculodes longimanus* (Bate and Westwood)⁷ has been taken off the Scilly Islands by D. Robertson and G. S. Brady.⁸ In this species the head is girdled by a pair of eyes in which the lenses are brilliantly iridescent, and their pigment is bright scarlet. *Westwoodilla caecula*, in which the eyes are much less conspicuous, 'was procured from trawl refuse which had been taken near the Eddystone Lighthouse.'⁹ *W. hyalina*, Bate, is, no doubt, as Bate himself suggests, the same species. There is not sufficient reason for adopting the later generic name *Halimedes* in place of *Westwoodilla*, nor is the specific name *caecula*, meaning 'a little blind,' at all inappropriate to this apparently dim-eyed creature. *Monoculodes carinatus*, Bate, has a fractional claim to be reckoned in the Cornish fauna, since Norman determines that *M. stimpsoni*, Bate, is the young male of this species, and Bate tells us that 'a mutilated portion' of *M. stimpsoni* was 'taken in the Channel off the west of Cornwall.'¹⁰

Epimeria cornigera (J. C. Fabricius), of the family now named Paramphithoidae, is recorded by Bate and Westwood under the name of *Acanthonotus owenii*, Bate. They say, 'Mr. Webster has dredged it at Falmouth.'¹¹ The remarks upon it which Bate makes in his 'Revision' of Couch's Fauna¹² are clearly out of place, and will be noticed under *Isaea montagui*, to which they properly apply. In the Lafystiidae, the little white parasitical *Lafystius sturionis*, Krøyer, obtained by Laughrin from fish at Polperro, is recorded by Bate under the name of *Darwinia compressa*.¹³ To the Acanthonotozomatidae belongs *Iphimedia obesa*, H. Rathke, 'dredged near Drake's Island, in Plymouth Sound.'¹⁴ The family Liljeborgiidae is represented by *Liljeborgia pallida*, Bate, from Plymouth Sound.¹⁵ The Calliopiidae, a family of numerous genera, comprises *Apherusa cirrus* (Bate), of which Bate, who wrongly identifies it with Krøyer's *Amphithoe bicuspis*, says, 'We have had specimens taken at Falmouth.'¹⁶ Here also stands *Apherusa bispinosa* (Bate). Bate, in his 'Revision,' naming it *Atylus bispinosus*, says, 'We have dredged this species on the sandy bottom in Whitsand Bay, not far from the Rame Head, and have had it sent to us from Falmouth.'¹⁷ To the Atylidae belongs *Nototropis swammerdamei* (Milne-Edwards), formerly included in the genus *Atylus*. Of this species Bate says, 'We have taken it in Plymouth Sound, and Mr. Loughrin has sent it to us from Polperro.'¹⁸ The Dexaminidae, in which the mandibles are without a palp, are represented by *Dexamine spinosa* (Montagu), 'occurring all round our coasts,'¹⁹ and obtained by Cocks from 'fishing boats, trawl refuse, etc.; not uncommon.'

The Gammaridae, of all the families most copious in genera and species, supply to Cornish waters *Gammarellus homari* (J. C. Fabricius), of which Bate, calling it *Amathilla sabini* (Leach), says that 'on the south coast of Cornwall it appears to have reached its minimum size, as it has not been recorded further south. It will be found in rocky pools near low-water mark occasionally everywhere.'²⁰ *Grayia imbricata*, Bate, 'taken in Falmouth Harbour,'²¹ is no doubt the young of the preceding species, as long ago suggested by Norman. The genus *Melita* (Leach) affords us three species,²² *M. palmata* (Montagu), obtained at Polperro by Laughrin and by Norman; ²³ *M. obtusata* (Montagu), of which Bate's *M. proxima* is a synonym, from Plymouth Sound; and *M. gladiosa*, Bate, both from that locality and from Falmouth.²⁴ The rose-tinted *Maera grossimana* (Montagu) is reported by Bate from Plymouth Sound, Penzance, and Polperro, by Cocks from 'Gwyllyn-vase, Swanpool, etc.; not uncommon,' and by Norman also from Falmouth.²⁵ To his genus *Megamoera* Bate refers four species. The first, *M. semiserrata*, Bate, was transferred to *Maera* by Norman in 1869.²⁶ Of *M. longimanus* (W. Thompson), Bate says, 'In Cornwall we only know it from Penzance, and there it was taken under St. Michael's Mount.' Of *M. othonis* (Milne-Edwards) he remarks, 'We have dredged this species in Plymouth Sound, and Mr. Laughrin has sent it to us from Polperro, but it has not been taken anywhere else in the British Isles.' The last statement was inaccurate,

¹ *Ann. Nat. Hist. Ser. 7*, vol. vi, 46.

² *Ibid.* p. 45.

³ *Ibid.* p. 45.

⁴ Norman, *Ann. Nat. Hist. Ser. 6*, vol. iii, 452.

⁵ *Ibid.* p. 50.

⁶ *Ibid.* p. 49.

⁷ *Ibid.* p. 51.

⁸ *Ibid.* p. 50.

⁹ *Ibid.* p. 53.

¹⁰ *Ibid.* p. 135.

¹¹ *Ibid.* p. 48.

¹² *Brit. Sess. Crust.* vol. i, 234.

¹³ *Ibid.* p. 48.

¹⁴ *Ibid.* p. 51.

¹⁵ *Ibid.* p. 54.

¹⁶ *Ann. Nat. Hist.* (1889), Ser. 6, vol. iv, 132.

¹⁷ *Ibid.* p. 135.

¹⁸ 'Revision,' p. 52.

¹⁹ *Ibid.* p. 44.

²⁰ *Brit. Sess. Crust.* vol. ii, 507.

²¹ 'Revision,' p. 47.

²² *Op. cit.* 47.

²³ *Ibid.* p. 48.

²⁴ *Ibid.* p. 51.

²⁵ *Ibid.* p. 47.

²⁶ *Ibid.* p. 127.

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besides being unattended by any attempt to disprove Norman's now fully accepted view that this species and the preceding one should alike be called *Maera othonis* (Milne-Edwards). For *Megamoera brevicaudata*, Bate, 'dredged in Plymouth Sound,'¹ the proper title is now held to be *Elasmopus rapax* (A. Costa).² *Pherusa fucicola*, Leach, is mentioned by Bate as known to him through specimens from Falmouth and Polperro. It is not quite certain what species these specimens may have represented, but it is tolerably clear that the species which Bate and Westwood describe as *Gammarella brevicaudata* and *G. normanni* are the male and female of the species which they figure as *Pherusa fucicola*, Leach,³ so that they have assigned three different designations to a single species. Leach's being the earliest of the three is the one that remains valid. In Cornwall, as elsewhere, the freshwater *Gammarus pulex* (Linn.) is abundant, and so is its marine congener *G. locusta* (Linn.), together with the more littoral *G. marinus*, Leach.⁴ Bate adds *G. campylops* (Leach), of which he says, 'It is not very common, but it has been taken among other places in Plymouth Sound.'⁵ Leach originally named it *G. camylops*, and justified its ill-formed name, meaning bent-eyed, by description of the 'eyes shaped like the capital letter S, extending from the upper part of the superior to the upper part of the base of the inferior antennae.'⁶

The Talitridae, which more than any other amphipods show a tendency to terrestrial life, are often on that account put foremost in classification. From the point of view of evolution, they will more naturally follow the Gammaridae, which may be regarded as the central family. This view, at least, is based on the supposition that all the other families can more easily be conceived as diverging from the Gammaridae, than the Gammaridae from any one of the others. The Cornish species of Talitridae are *Talitrus saltator* (Montagu), the sand-hopper; *Orchestia gammarellus* (Pallas), the shore-hopper; *Talorchestia deshayesii* (Audouin), also a sand-hopper; *Hyale prevostii* (Milne-Edwards), recorded by Bate as '*Allorchestes Nilssonii* (Rathke),' for which *A. nilssonii* should be read, and *Hyale pontica* (Rathke), of which Bate, using for it his own name *Nicea Lubbockiana*, says, 'I have received specimens of this species from Falmouth and Penzance.'⁷ Cocks mentions only the first two species given above in this family.

The Aoridae offer the widely distributed *Aora gracilis* (Bate), obtained by that author 'from St. Ives and off the Eddystone,'⁸ a species perhaps not properly distinguishable from *A. typica*, Kröyer, but in any case remarkable for the elongate first gnathopods of the male. In these organs it is not the sixth joint that is modified to assist in the act of prehension, but the fourth is abnormally produced for that purpose. *Microdeutopus versiculatus*, Bate, has been dredged by him in Plymouth Sound. It was transferred by Norman in 1905 to a new genus *Coremapus*. Of his *Lembos websterii*, Bate says, 'Mr. Webster dredged this species in Falmouth Harbour.'⁹ Both these genera agree with *Aora* in having the first gnathopods larger than the second; but in the male of *Coremapus* it is the fifth joint, not the fourth, that is produced to help prehension, and in *Lembos* neither fourth nor fifth, the gnathopods being subchelate in the ordinary fashion between the finger and the sixth joint. In the family Photidae the red-eyed species called by Bate *Eurystheus erythrophthalmus* (Liljeborg), and said to be 'not uncommon in Plymouth Sound,'¹⁰ should take its specific name from the earlier *Gammarus maculatus*, Johnston.¹¹ *Isaea montagui*,¹² Milne-Edwards, is mentioned by Bate in his 'Revision' of Couch rather confusingly, since he assigns no Cornish locality. In his earlier work he wrote, 'We have procured it from some refuse brought by the trawlers from the neighbourhood of the Eddystone. All our specimens were taken from the back and branchial chambers of *Maia squinado*; they seemed, indeed, to exist among the thick stiff fur on the carapace of this spider-crab as if they were in their accustomed habitat, their prehensile legs being peculiarly adapted for holding themselves on that animal.'¹³ In the 'Revision'¹⁴ this is transferred almost verbatim to the account of the so-called *Acanthonotus owenii*, which has no limbs specially prehensile, instead of having an extra supply, as is the case with *Isaea montagui*.

The Ampithoidae furnish *Ampithoe rubricata* (Montagu), found by Cocks 'under stones, algae, etc., Gwyllyn-vase, Swanpool, Bar-point; not uncommon.' *A. littorina*, Bate, is doubtless a synonym of this species. *Sunamphitoe conformata*, Bate, was taken by him in Plymouth Sound. The later *S. hamulus*, Bate, which is perhaps identical with the preceding, was sent to him from Penzance.¹⁵ *Pleonexes gammaroides*, Bate, is not included in his 'Revision,' but under the heading *Ampithoe gammaroides* he earlier, wrote of specimens which 'were sent to us by the late Mr. Barlee, who obtained them at Penzance.'¹⁶ In the first and the last of these three genera the mandibles have 'palps,' but in *Sunamphitoe* these are wanting. In *Pleonexes* the hinder peraeopods have the sixth

¹ 'Revision,' p. 55.

² *Brit. Sess. Crust.* vol. i, 255, 330-333.

³ Cocks, in his often quoted work, p. 83.

⁴ 'Revision,' p. 54.

⁵ 'Revision,' p. 44.

⁶ *Ibid.* p. 52.

⁷ *Ibid.* vol. i, p. 216.

⁸ *Ibid.* pp. 56, 57.

⁹ Walker, in *Ann. Nat. Hist.* (1895), Ser. 6, vol. xvi, 671.

¹⁰ *Edin. Encycl.* (1813), vol. vii, 403.

¹¹ *Ibid.* p. 52.

¹² *Ibid.* p. 54.

¹³ *Brit. Sess. Crust.* vol. i, pp. 354, 399.

¹⁴ *Op. cit.* pp. 47, 48.

¹⁵ *Brit. Sess. Crust.* vol. i, p. 428.

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joint much more expanded distally than is the case in *Ampithoe*. Bate reports as Cornish four species which he assigns to *Podocerus*: *P. pulchellus* (Leach), *P. variegatus*, Leach, *P. capillatus*, Rathke, and *P. falcatus* (Montagu). But Leach's determinations until recently have been misunderstood. The true *P. variegatus* of that author was quite a different species from that to which Bate fitted the name. The first and second of Bate's four species should be called *Jassa pulchella*, Leach. Montagu's *falcatus* remains obscure. Rathke's *Podocerus capillatus*, distinguished by its strongly setose antennae, has now become *Parajassa pelagica* (Leach), the two genera *Jassa* and *Parajassa* standing in a family Jassidae. On the other hand *Podocerus variegatus*, Leach, is the type of the true Podoceridae. It is now known to be identical with the species which Bate described under the now discarded name *Cyrtophium darwinii*. It may be recognized by its protruding eyes and corrugated back, and by the facility with which its appendages break off.¹ Concerning it Bate and Westwood say, 'We have only as yet received specimens of this species from Mr. Webster, some of which he dredged off Falmouth, the others he obtained on the beach, at low water at St. Michael's Mount.'²

In the Corophiidae the form which Bate describes as *Cerapus abditus*, Templeton, from Plymouth Sound,³ should in my opinion be transferred to the genus *Erichthonius* (Milne-Edwards). That species of *Corophium* occur in Cornwall lies under no reasonable doubt, but evidence as to localities and specific distinctions is not very clear. The timber-boring *Chelura terebrans*, Philippi, of the family Cheluridae, was found by Laughrin at Polperro, and by Norman at Falmouth.⁴

The tribe Hyperiidea has hitherto met with scant attention from naturalists in Cornwall. Cocks makes mention of '*Hyperia Latreillii*, Edw.—Trawl refuse, stomach of *Trigla hirundo*: rare,' and Bate of *Hyperia galba* (Montagu), 'taken in the sea floating in medusae, off the coast.'⁵ The former name is probably a synonym of the latter.

In the Caprellidea the family Caprellidae is beset by numerous difficulties, arising from variability within the species, from differences due to sex and age, and from the many false identifications into which authors have been more or less excusably betrayed. Especially in the genus *Caprella* (Lamarck), have these circumstances led to confusion. In this genus the first and second pairs of pereopods are wanting, being represented only by their branchial vesicles. Bate gives to Cornwall an allowance of seven species.⁶ But *C. linearis* (Linn.) probably includes his *C. lobata*, from Plymouth Sound. Of *C. penantis*, Leach, Bate using the later name *C. acutifrons*, Latreille, says, 'Taken in Plymouth Sound; and Mr. R. Q. Couch informed me that it is not uncommon among corallines in Mount's Bay.' The *C. hystrix*, Kröyer, which he likewise reports from Plymouth Sound, is regarded by Norman and Dr. Paul Mayer as probably belonging to *C. septentrionalis*, Kröyer, Mayer distinguishing it as '*forma γ nodigera*.'⁷ *C. acanthifera*, Leach, 'has been taken at Plymouth, on Drake's Island at low water; as well as dredged in the Sound.' Of '*C. tuberculata*, Guérin,' Bate and Westwood say, 'A considerable number were found by Mr. T. L. Couch in the crevices of a crab-pot buoy thrown on the coast at Polperro during a heavy gale in 1854, and Mr. R. Q. Couch obtained the female in Gwavas Lake, and off St. Michael's Mount, among confervae.'⁸ This statement is no doubt due to Spence Bate himself, who is not deterred by that circumstance from misquoting it in his 'Revision.' Mayer decides that the British species has nothing to do with Guérin's *C. tuberculata*, yet even in his latest work offers no alternative name.⁹ I now therefore propose that it should be called *C. westwoodi*. *C. equilibra*, Say, is reported by Bate as 'Taken in Plymouth Sound on buoys hid among weeds.' Under the now discarded title *Proto pedata* (Abildgaard), he records *Phthisica marina*, Slabber, remarking that 'the late Mr. R. Q. Couch took it at Mousehole, Cornwall.' This genus, though as slender and consumptive-looking as most other Caprellids, has at least the full complement of trunk limbs in seven pairs. Lastly, under the long standing name *Protella phasma* (Montagu), Bate reports the species which Mayer in 1890 transferred to a new genus *Pseudoprotella*.¹⁰ In this, as in *Protella*, the first and second pereopods are degraded, but whereas they are only one-jointed in *Protella*, in the newer genus they are two-jointed. The species was found by Mr. R. Q. Couch 'among confervae at Lariggan rocks, Mount's Bay, Cornwall.' Cocks found this and the preceding species, and *Caprella linearis*, *C. acanthifera*, and *C. penantis*, at his favourite collecting station, Gwyllyn-vase.

The Entomostraca comprise three extensive divisions, as to which it will be convenient to remember that the Ostracoda have the body enclosed in a bivalved shell-covering and normally unsegmented; the Branchiopoda have a very variable number of body segments, with or without a

¹ Stebbing, in *Ann. Nat. Hist.* (1899) Ser. 7, vol. iii, p. 237.

² *Ibid.* p. 456.

³ Revision, p. 60.

⁴ *Die Caprelliden des Golfes von Neapel*, Nachtrag (1890), pp. 61, 66.

⁵ *Brit. Sess. Crust.* vol. ii, p. 70.

⁶ *Die Caprelliden*, Nachtrag, p. 61, and *Die Caprelliden der Siboga-Expedition* (1903) p. 126.

¹⁰ *Die Caprelliden*, Nachtrag, pp. 8, 18.

² *Brit. Sess. Crust.* vol. i, p. 482.

⁴ *Ibid.* p. 507.

⁶ *Ibid.* pp. 61, 62.

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bivalved or simple shield, and with some of the appendages behind the mouth normally branchial; the Copepoda have normally a segmented body, not enclosed in a bivalved shell-covering, the segments not exceeding eleven, the limbs not branchial.

The Branchiopoda are divided into orders, of which the Phyllopoda here claim our attention on account of a single species in the family Branchipodidae. This family belongs to a group in which the body is long and flexible, without shield, and the eyes are stalked and movable. Of the species in question Mr. Rupert Vallentin says, 'In a roadside pool, near the entrance of Enys, I found numerous specimens of that interesting crustacean *Chirocephalus diaphanus*, Prevost. I have been informed by my friend Mr. W. Garstang, of the Plymouth Marine Biological Association, that "a gentleman in Plymouth, many years ago, secured some specimens of *Chirocephalus* in a road-side pond near Grampound road." This is the only record I have been able to find of *Chirocephalus* occurring in Cornwall.'¹ This large and beautiful entomostracan is widely distributed over England. Its eggs lie in wait in dried mud, to hatch out when kindly rain provides a pool however shallow.

The 'branching-horned' order Cladocera is more amply represented than the phyllopods. Named from their two-branched second antennae, these little animals are like the Ostracoda in having a bivalved test or shell-covering, but unlike them in having the head distinct. While *Chirocephalus* can boast of having eleven pairs of feet, the number of pairs in the Cladocera ranges only from four to six. There are two sections Calyptomera and Gymnomera. The former contains a tribe called Anomopoda, because its feet are not all similar, the front ones being more or less prehensile, without branchial laminae. This great tribe is divided into four families, at the head of which stands that of the Daphniidae. To this belongs *Daphnia pulex* (de Geer), which Cocks reports from 'Ponds Budock bottom, moorstone quarry: in trough near Mr. Jago's farm cottage, Trevethan, etc.'² He adds 'var (*D. psittacea*, Baird), water-trough, Jago's farm, &c.' Dr. G. S. Brady, who in 1898 transferred *Daphnia magna*, Strauss, to a new genus, *Dactylura*, records that species from Tresco in the Scilly Islands, and appends a note, '*Daphnia psittacea*, Baird, is quite unknown to me, though noted by some continental authors.'³ As *Daphnia vetula* (Müller), Cocks reports the species since known as *Simoccephalus vetulus* (O. F. M.), but now as *Simosa vetula*,⁴ from 'Pond near dog-kennel, Panscouth lane; ditch, Gwyllyn-vase, etc.' To the next family Bosminidae belongs *Bosmina longirostris* (O. F. M.), which Cocks found 'In water from a ship's tank, just arrived from London: 1853.' So far therefore the species can only be regarded as an immigrant, but it is in truth widely distributed, and recently Mr. Rupert Vallentin, F.L.S., has recorded this and various other entomostraca from the Looe Pool in the north-eastern extremity of Mount's Bay. The Macrotrichidae are without a recorded representative. The fourth family, the Chydoridae, furnishes the tiny animated globe *Chydorus sphaericus* (O. F. M.), from 'Ponds, College wood, etc.'; *Eurycercus lamellatus* (O. F. M.), from 'Stagnant water, Budock bottom, near stone quarry'; *Alona quadrangularis* (O. F. M.), from 'Stagnant pools, Pennance, Budock bottom, etc.'; and *Pleuroxus trigonellus* (O. F. M.), from 'Boggy ground near Trigonigg Farm.'

The section Gymnomera, with a carapace too small to cover the thoracic feet, in its tribe Onychopoda has but a single family, the Polyphemidae. Here there are only four pairs of feet and the eyes are conspicuously large. *Polyphemus pediculus*, de Geer, is reported by Cocks from 'Stagnant water in butt; ditch, Gwyllyn-vase, etc.' All the above are freshwater species. A marine entomostracan is recorded by Mr. Vallentin, who in his *Additions to the Fauna of Falmouth* already quoted says, '*Evadne normanii*, Loven, is to be found in tow-net gatherings at most seasons of the year.' The species belongs to the family Polyphemidae, and should be written *Evadne nordmanni*, Lovén.

The Ostracoda are divided into two tribes, the Myodocopa, which almost always have a rostral sinus to their shells, and almost always have a heart, and the Podocopa which have neither. Three families of the former exclusively marine tribe come under consideration. The Asteropidae, which have compound lateral eyes and are distinguished from all other Ostracoda by seven pairs of long branchial leaves folding over the extremity of the animal, here possess two species of the genus *Asterope*, namely, *A. mariae* (Baird), found at Penzance by Norman, at the Scilly Isles by Brady and Robertson,⁵ and *A. teres* (Norman), taken at the latter locality by the same companions. There also they obtained *Philomedes interpuncta* (Baird), of the family Cypridinidae, the eyes of the female in this genus being small or wanting, those of the male well developed.⁶ In the Polycopidae, which

¹ 'Additions to the Fauna of Falmouth,' in the *Fifty-Ninth Annual Report of the Roy. Cornw. Polyt. Soc.* 1891 (1892), p. 97.

² 'Contributions to the Falmouth Fauna, Entomostraca.' *The Twenty-Fourth Annual Report of the Royal Cornw. Polyt. Soc.*, 1856 (1857), pp. 15-19. All the quotations from Mr. W. P. Cocks on Entomostraca are from this paper.

³ *Trans. Nat. Hist. Northumberland, etc.* (1898), vol. xiii, pt. 2, pp. 243, 244.

⁴ Norman, in *Ann. Nat. Hist.* (1903), Ser. 7, vol. xi, p. 367.

⁵ Brady and Norman, in *Trans. Royal Dublin Soc.* (1896), Ser. 2, vol. v, p. 633.

⁶ *Ibid.* p. 653.

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are without eyes and approach the next tribe by having no heart and little or no rostral sinus, *Polycopse orbicularis*, Sars, is recorded from the Scilly Islands,¹ and *Polycopsis compressa* (Brady and Robertson) was 'dredged off the Eddystone Lighthouse, and amongst the Scilly Islands, 10-40 fathoms, by the two authorities who named the species.'²

The Podocopa are divided among the families Cyprididae, Bairdiidae, Cytheridae, Paradoxostomatidae, Darwinulidae, and Cytherellidae. The first is remarkable for the extent to which parthenogenetic propagation prevails in some of the genera. Within this family Cocks mentions *Cypris vidua*, Müller, from 'Pond near Panscouth lane, etc.'; *C. fusca*, Straus, from 'Ditch, Swanpool, and Gwyllyn-vase,' and *C. strigata*, Latreille, from the same localities. These species are now called respectively *Pionocypris vidua* (O. F. M.), *Cypris fuscata*, Jurine, and *Erpetocypris strigata* (O. F. M.). *Argilloecia cylindrica*, Sars, of which '*Pontocypris* ? *angusta*, Brady,' is a synonym, is reported by Brady and Norman from 'off the Eddystone Lighthouse, and off St. Mary's, Scilly (B. and R.).'³ Brady and Robertson have taken *Cypridopsis aculeata* (O. Costa) in the Scilly Islands.⁴ These two naturalists express disappointment at the results of their dredging expedition in that small archipelago. Nevertheless it enabled them to record some sixty species of marine Ostracoda. Four of these have been mentioned above in the first tribe. The remainder we must be content to apportion among the here accepted families, with only a brief occasional note. The authors introduce them with a collective statement: 'The following list embraces all the species found in our dredging amongst the Scilly Islands, and in a littoral gathering of muddy sand from St. Mary's. The localities dredged were as follows: Off Porcressa Bay, St. Mary's, 20-30 fathoms, hard sand; SW. off St. Agnes; 8-10 fathoms, hard sand; New Grimsby Harbour, 10-14 fathoms, muddy sand.'⁵

In the family Cyprididae stand *Pontocypris mytiloides* (Norman), *P. trigonella*, Sars, and *Paracypris polita*, Sars. The Bairdiidae were unrepresented. The almost exclusively marine family Cytheridae, on the other hand, gave rich results. In the genus *Cythere* (Müller), for *C. viridis*, Müller, should no doubt be read *C. lutea*, Müller.⁶ The next species named is *C. albomaculata*, Baird. Then follow *C. pellucida*, Baird, and *C. castanea*, Sars, as to which one may presume that the second is the true *pellucida*, and the first the *C. confusa* of Brady and Norman.⁷ After these come *C. porcellanea*, Brady; *C. Macallana*, Brady and Robertson; *C. badia*, Norman, for which Fowey Harbour is added by Brady, and 'Rock pools, at Mount's Bay, Cornwall,' by Norman;⁸ *C. crispata*, Brady, *C. Robertsoni*, Brady, *C. villosa* (Sars), *C. convexa*, Baird, *C. oblonga*, Brady, *C. cuneiformis*, Brady, *C. latissima*, Brady, for which Brady and Norman substitute the earlier name *C. marginata*, Norman;⁹ *C. emaciata*, Brady, *C. antiquata* (Baird), *C. semipunctata*, Brady, the last three having also been taken off the Eddystone Lighthouse, from which locality Brady and Norman add a species not in this list, *C. jonesii* (Baird).¹⁰ The list as revised somewhat qualifies the criticism passed on it by its authors, who say, 'There is a distinct absence of the characteristic northern forms, and an almost equal want of such species as *Cythere emaciata*, *Bairdia acanthigera*, etc., which find their greatest development on the south coast. *Cythere lutea*, a common species of both the littoral and laminarian zones in most (and more especially in the northern) districts of Britain, is wanting.' All faunistic catalogues require the control of prolonged experience, and this the most skilful observers cannot acquire in one short visit.

To the genus *Cytheridea* (Bosquet) the list attributes *C. cornea*, Brady and Robertson, and *C. elongata*, Brady, the former of which is now held to be merely a junior form of the latter and earlier named species.¹¹ In *Eucythere* (Brady) the two species *E. argus* (Sars) and *E. declivis* (Norman) are now both placed under the latter designation.¹² In *Loxoconcha* (Sars) the list gives *L. impressa* (Baird); *L. granulata* (Sars), for which Brady and Norman substitute *L. guttata* (Norman), adding the Eddystone Lighthouse as a locality for it;¹³ *L. multifora* (Norman), which has also been taken in 'Fowey Harbour, Cornwall';¹⁴ and *L. tamarindus* (Jones). *Xestoleberis* (Sars) yielded the new species *X. labiata*, Brady and Robertson, of which the chief peculiarity is 'a remarkable labiate projection of the postero-inferior angle of the shell, which is more distinctly visible on the right valve.' It was 'dredged in New Grimsby Harbour on a bottom of muddy sand, in a depth of about 14 fathoms,' and has been taken also at Falmouth by Norman. *X. depressa*, Sars, was also obtained, and *X. aurantiaca* (Baird), the latter occurring moreover off the Eddystone. *Cytherura* (Sars) has a plentiful supply of species in the record. These are *C. nigrescens* (Baird), reported also from Falmouth by Cocks; *C. similis*, Sars, for which apparently Brady and Norman substitute *C. simplex*

¹ Brady and Norman, in *Trans. Royal Dublin Soc.* (1896), Ser. 2, vol. v, p. 707.

² *Ibid.* p. 711.

³ *Ibid.* p. 90, and Ser. 2, vol. v, 725.

⁴ *Trans. Royal Dublin Soc.* Ser. 2, vol. iv, 125, 135.

⁵ *Ibid.* p. 131.

⁶ *Ibid.* p. 142.

⁷ *Ibid.* p. 172.

⁸ *Ibid.* p. 184.

⁹ *Ibid.* (1889), Ser. 2, vol. iv, p. 111.

¹⁰ *Ann. Nat. Hist.* (1874), Ser. 4, vol. xiii, 115.

¹¹ *Ibid.* pp. 126, 127.

¹² *Ibid.* pp. 159, 169, 130, 169.

¹³ *Ibid.* p. 179.

¹⁴ *Ibid.* p. 185.

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as a new species,¹ to which also they assign *C. sarsii*, Brady, local variety, while the original *C. sarsii*, Brady, is made a synonym of *C. similis*, Sars, without being localized in the Scilly Islands. The new species *C. fulva*, Brady and Robertson, 'dredged pretty abundantly on a bottom of hard granite mud, in a depth of 10-40 fathoms, off St. Mary's and St. Agnes,' has since been taken in 'Fowey Harbour, 3 and 4 fathoms,' and off the Eddystone Lighthouse.² *C. flavescens*, Brady, and *C. cuneata*, Brady, have both been since identified with the earlier *C. sella*, Sars; and *C. cornuta*, Brady, is accepted by Brady and Norman as covering Brady's *C. gibba*, which is distinct from O. F. Müller's species that bears the same name. *C. striata*, Sars, *C. angulata*, Brady, *C. producta*, Brady, taken also off the Eddystone; *C. acuticostata*, Sars, and *C. cellulosa*, Norman, complete the enumeration in the genus *Cytherura*. *Pseudocythere* (Sars) has its single species *P. caudata*, Sars, which has been taken also off the Eddystone.³ *Cytheropteron* (Sars) contributes *P. latissimum* (Norman), *C. nodosum*, Brady, and *C. subcircinatum*, G. O. Sars, which Brady and Norman find to be wrongly identified, and therefore substitute for it *C. depressum*, n. sp.⁴ Both this and *C. nodosum* have also been found off the Eddystone. *Bythocythere* (Sars) yielded *B. constricta*, Sars, and *B. turgida*, Sars, both common also to the Eddystone. *Cytherideis* (Rupert Jones) is represented by a large black-banded local variety, *fasciata*, of *C. subulata*, Brady; *Sclerochilus* (Sars) by *S. contortus* (Norman), and *Cytherois* (G. W. Müller) by *C. fischeri* (Sars), which the list places under the next genus. In G. W. Müller's opinion the family Paradoxostomatidae should not rank higher than a sub-family of the Cytheridae. The genus *Paradoxostoma* (Fischer), in the list under discussion, has the species *P. abbreviatum*, Sars, *P. variable* (Baird), *P. ensiforme*, Brady, *P. cuneatum*, n. sp., of which the authors say: 'A few specimens of this species were dredged at New Grimsby Harbour and inside St. Mary's in depths of from 10-15 fathoms,' but Brady and Norman identify it with the earlier *P. orcadense*, Brady and Robertson, from the Orkneys, saying: 'The Scilly specimens are smaller and more angular than the types, and were at first supposed to be distinct (described as *P. cuneatum*), but further examination leads us to conclude that they belong properly to *P. orcadense*.'⁵ The remaining species are *P. hibernicum*, Brady, *P. normani*, Brady, the rare *P. arcuatum*, Brady, *P. flexuosum*, Brady, belonging also to the Eddystone; and lastly *P. obliquum*, Sars, reported further by Norman from Mylor Creek, Falmouth.⁶ Cocks records *Cythere flavida*, Müller, from 'Minute Algae, etc., ponds on rocks, Gwyllyn-vase, west,' and *Cythere variabilis*, Baird, from the same localities.⁷ Probably both of these are *Paradoxostoma variabile* (Baird).⁸ Bate in his 'Revision' names thirty-eight species of Ostracoda as 'dredged off the Cornish coast,'⁹ but the species not included among those above recorded appear really to have been dredged rather off the coast of Devon than of Cornwall.

To deal with the Copepoda of the county within any reasonable limits is exceedingly difficult. Their localities are known chiefly through Dr. G. S. Brady's report of them in his *Monograph of British Copepoda*, published by the Ray Society. On the classification of this order Dr. W. Giesbrecht is the leading authority, and, so far as it extends, the systematic index which he and Dr. Schmeil supply in the Copepoda (gymnoplea) of *Das Tierreich* (1898) may conveniently be followed. An ordinary copepod may be conceived as forming two compartments. There are eleven segments, the composite first being the head, the next five the thorax, and the last five the abdomen. Between head and thorax, however, there is so close a union that they together form the first compartment, the abdomen or pleon forming the second. But there is this peculiarity, that the middle segment is sometimes continuous with the broader fore-body, sometimes with the narrower hind-body. In the former case the hind-body has no feet, but consists of the pleon pure and simple. The species so constructed are called Gymnoplea, meaning 'those that have the pleon bare,' that is devoid of feet. This group is divided by Giesbrecht and Schmeil into five families. In the first of these, the Calanidae, the males have both antennae of the first pair symmetrical or nearly so, acting as sense organs, whereas in the other four families one of the pair is geniculate, adapted for clasping the female. Mr. Vallentin reports from Falmouth '*Calanus finmarchicus*, Brady,'¹⁰ for which should rather be read *C. finmarchicus*, Gunner. To the next family Diaptomidae (Giesbrecht's Centropagidae) belongs '*Diaptomus castor*, Westwood,' reported by Cocks from 'Pond, Panscouth lane,'¹¹ but whether this be Jurine's original *Monoculus castor* or an allied species cannot be decided. From the same family Vallentin records *Centropages typicus*, Kröyer, and *Temora longicornis* (O. F. Müller) in Falmouth waters, to which Brady adds *Eurytemora affinis* (Poppe), saying 'the Rev. Dr. Norman has sent me specimens from Swan Pool,

¹ *Trans. Roy. Dublin Soc.*, Ser. 2, vol. iv, pp. 230, 203.

² *Ibid.* p. 225.

⁴ *Ibid.* p. 218.

⁶ *Ibid.* p. 230.

⁸ *Trans. Royal Dublin Soc.* Ser. 2, vol. iv, 229.

¹⁰ *Cornw. Soc. the Fifty-ninth Annual Report*, 1891 (1892), p. 97. This reference applies to all the Copepoda recorded by Mr. Rupert Vallentin.

¹¹ *Ibid.* 1856 (1857), p. 18.

³ *Ibid.* p. 206.

⁵ *Ibid.* p. 234.

⁷ *Cornw. Soc.* (1857), p. 17.

⁹ *Op. cit.* pp. 73, 74.

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Falmouth,'¹ and *Metridia armata*, Boeck, of which he says, 'I have myself taken it, though very sparingly, in the surface-net amongst the Scilly Islands.'² Giesbrecht and Schmeil, however, identify this species with the earlier *M. lucens*, Boeck.³ In the Candaciidae, Brady says of his own '*Candace pectinata*,' 'a very few specimens of this interesting species were dredged by Mr. Robertson and myself in June, 1873, on very hard ground, and in a depth of about 40 fathoms, south-west of the island of St. Agnes, Scilly.'⁴ The generic name is more properly *Candacia* (Dana). The family Pontellidae is represented by *Parapontella brevicornis* (Lubbock), which Brady found among Algae and *Zostera* at the Scilly Islands,⁵ and from Falmouth, Vallentin reports *Dias longiremis*, Lillejeborg, and *Pontella wollastoni*, Lubbock; the former now known as *Acartia longiremis*, the latter as *Labidocera wollastoni*. Here also occurs the widely and profusely distributed, the brilliantly and variously coloured, little *Anomalocera patersonii*, Templeton. Under the heading 'Pelagic Copepoda,' Vallentin says, 'Considering the important part played by these forms in serving as food to many fish during their larval or adult conditions, it is astounding that more attention has not been given to them by Falmouth naturalists. With the exception of one record of the capture of *Anomalocera patersonii*, Temp. . . .,' as procured by Dr. Vigurs in his tow-net, August, 1850, 'I have been unable to discover a single reference to any of the marine pelagic copepods occurring at Falmouth.' Cocks, however, must be added to the recorders, since in 1857 he reports it as found 'in water from harbour; ponds on rocks, Gwyllyn-vase. Taken by Dr. Vigurs in his tow-net, harbour, etc.'

The Podoplea, copepods 'that have feet on the pleon,' are named from the circumstance that the fifth thoracic segment seems to have deserted the thorax for an alliance with the pleon, to which it commonly contributes a pair of feet. The families are numerous, and not to be understood without careful study. The most familiar is the Cyclopidae, in which the genus *Cyclops* is said to contain no species that can be relied on as being exclusively marine. Cocks gives *C. quadricornis*, Linn., from 'Water-tank and pond, near Mr. Jago's farm house.' More than one species was named *quadricornis* by Jurine, and which of them is here intended remains obscure. Brady took *C. vicinus*, Uljanin, from pond at Tresco (Scilly), and at first named it *C. pulchellus*, Koch.⁶ From the same locality he obtained *C. fimbriatus*, Fischer, at first naming it *C. crassicornis*, O.F.M.⁷ The specimens from Tresco and other places on which he founded *C. helleri* having all been lost, Brady thinks it 'best for the present to regard the species as one of doubtful validity.'⁸ *C. aequoreus*, Fischer, he found at St. Mary's (Scilly), and regards it as 'probably a pretty common inhabitant of the brackish pools of salt marshes.'⁹ *Cyclopina littoralis*, Brady, was obtained by that author 'amongst the Scilly Islands in 14 fathoms.'¹⁰ *Oithona spinirostris*, Claus, belonging to a genus exclusively marine, is recorded by Vallentin from Falmouth.

In the family Arpacticidae the cephalothorax is not strongly distinguished from the pleon. In the wide sense this is an enormous group. For convenience it has been broken up into several subordinate families or sub-families. To the Longipediidae belong *Longipedia scotti*, Sars, called *L. coronata*, Claus, by Brady, who found it 'off St. Mary and St. Agnes, Scilly Islands';¹¹ *Ectinosoma sarsii*, Boeck, called *E. spinipes* by Brady, from 'Scilly Islands, 10 to 40 fathoms';¹² *E. melaniceps*, Boeck, found 'sparingly amongst weeds near low-water mark at St. Mary's, Scilly';¹³ and *Bradya typica*, Boeck, 'taken off Porcressa Bay (Scilly Islands) in a depth of 20 fathoms.'¹⁴ To the Tachidiidae, Brady assigns *Tachidius brevicornis* (O.F.M.), from 'pond at St. Mary's, Scilly Islands,'¹⁵ and *Euterpe gracilis*, Claus, recorded by Vallentin from Falmouth, and by Giesbrecht identified with the earlier *Euterpina acutifrons* (Dana).¹⁶ The Stenheiliidae are represented by *Stenhelima ima*, Brady, from St. Mary's, Scilly,¹⁷ *S. pygmaea*, Norman and Scott, near Eddystone; *S. varians*, Norman and Scott, outside Fowey, *Parastenhelima anglica*, Norman and Scott, from the same locality, and *Danielssenia fusiformis* (Brady and Robertson), which 'occurred plentifully in a dredging made off Porcressa Bay, Scilly, in 20 fathoms, on a bottom of hard sand.'¹⁸ The Canthocampidae have in the title genus *Canthocampus* (Westwood), *C. palustris*, Brady, 'taken in a large pond, subject to occasional tidal influx, at St. Mary's (Scilly),'¹⁹ and Cocks reports *C. minutus*, Baird, from 'water-butt, pond, etc.,' and *C. stromii*, Baird, from 'minute Algae, corallines, etc., ponds on rock, Gwyllyn-vase.' Of these two species Brady accepts the former as *C. minutus* (O.F.M.), but transfers the other to *Dactylopus* (Claus) (now *Dactylopusia*, Norman). *D. ornata* and several other new copepoda have

¹ Trans. Nat. Hist. Soc. Northumb. etc. (1891), vol. xi, pt. 1, p. 105.

² Monograph of British Copepoda, vol. i (1878), p. 44.

³ Mon. in Das Tierreich (1898), p. 106.

⁴ Mon. Brit. Cop., vol. i, p. 50.

⁵ Ibid. p. 71.

⁶ Trans. Nat. Hist. Soc. Northumb. etc. (1891), vol. iv, pt. 1, p. 78.

⁷ Ibid. p. 91.

⁸ Ibid. p. 92.

⁹ Mon. Brit. Cop. vol. i, 120.

¹⁰ Ibid. p. 93.

¹¹ Ibid. vol. ii (1880), p. 8.

¹² Ibid. p. 10.

¹³ Ibid. p. 12.

¹⁴ Ibid. p. 18.

¹⁵ Ibid. p. 22.

¹⁶ Pelagische Copepoden von Neapel (1892), Mon. 19, p. 555.

¹⁷ Mon. Brit. Cop. vol. ii, p. 36.

¹⁸ Ibid. p. 41.

¹⁹ Ibid. p. 54.

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recently been added to the Cornish fauna by Norman and Dr. T. Scott.¹ *Tetragoniceps malleolata*, Brady, was a new species 'found amongst dredged material from a depth of 12 fathoms inside St. Agnes (Scilly Islands).'² *Diosaccus tenuicornis* (Claus), was taken 'on weeds at low-water-mark, St. Mary's, Scilly.'³ Of *Laophonte serrata* (Claus), Dr. Brady says, 'This is by no means a common species. Mr. Robertson and I dredged a few specimens in a depth of 10 to 12 fathoms off St. Agnes (Scilly), and likewise took a few amongst weeds at St. Mary's.'⁴ *L. similis* (Claus) was found at the 'Scilly Islands, dredged in 14 fathoms, and plentiful on weeds between tide marks';⁵ *L. lamellifera* (Claus) was obtained in dredgings from a depth of 20 fathoms among the Scilly Islands;⁶ and *L. hispida* (Brady and Robertson) at the same locality in depths of 10 to 20 fathoms.⁷ *Laophontina dubia*, Norman and Scott, was dredged at St. Mary's in 1903. *Normanella dubia* (Brady and Robertson) occurred 'at New Grimsby and Porcessa Bay, Scilly, 14 to 20 fathoms.'⁸ *Cletodes limicola* (Brady), was taken 'amongst the Scilly Islands'; *C. propinqua*, Brady and Robertson, 'In 20 fathoms off St. Mary's, and in 14 fathoms, New Grimsby Harbour'; *C. linearis* (Claus), amongst *Algae* at St. Mary's.⁹ *Eubydrosoma curvatum* (Brady and Robertson) was procured 'off Porcessa Bay and in New Grimsby Harbour (Scilly Islands), dredged in 10 to 20 fathoms.'¹⁰ The Arpacticidae in a restricted sense include *Dactylopusia tisboides* (Claus) from the 'Scilly Islands, 10 to 40 fathoms'; *D. brevicornis* (Claus), from the same place, between 20 and 40 fathoms; and *D. stromii* (Baird) from the same locality, but procured by the surface net.¹¹ Concerning the last Brady says: 'Some doubt must rest upon the identification of this with Dr. Baird's *Canthocamptus Stromii*, but as I am unable to suggest any other species to which Dr. Baird's description might better apply, I follow the nomenclature adopted by Dr. Claus and Mr. Norman.' *Thalestris mysis*, Claus, is reported from the 'Scilly Islands, dredged in 10 to 12 fathoms, and taken in the surface-net and amongst weeds at low water'; and *T. rufocincta*, Brady, from the same islands at the same depth, 'and also on algae in Porcessa Bay, St. Mary's.' In discussing the localities of *T. harpactoides*, Claus, Brady says: 'I have a single specimen, apparently belonging to the same species, which was dredged amongst the Scilly Islands.' There also he took *T. clausii*, Norman, and of *T. serrulata*, Brady, a single specimen, a male, was 'dredged on a bottom of muddy sand in New Grimsby Harbour, at a depth of 14 fathoms.' *T. longimana*, Claus, was dredged by Brady abundantly at these islands, and also got in the surface-net. Of *T. peltata* (Boeck) 'one specimen only was found in dredged material from a depth of 40 fathoms off St. Agnes.'¹² *Westwoodia nobilis* (Baird) was found by Brady 'near St. Agnes (Scilly), 10 to 12 fathoms,'¹³ and is also recorded by Cocks as *Arpacticus nobilis* (Baird) from 'Ponds on rocks, Gwyllyn-vase.' *Arpacticus chelifer* (O.F.M.) was found by Brady in the Scilly Islands,¹⁴ and by Cocks 'In sea-water from Green Bank.' *A. flexus*, Brady and Robertson, was 'dredged in depths of 10 to 20 fathoms amongst the Scilly Islands'; *Zaus spinatus*, Goodsir, 'in 10 to 12 fathoms'; *Alteutha crenulata*, Brady (assigned in the first instance to *Peltidium*), was found 'On Algae near low-water mark at St. Mary's and St. Agnes (Scilly Islands), where it was also taken in the surface-net in the evening.'¹⁵ *Peltidium conspicuum*, Norman and Scott, was taken in New Grimsby Harbour in 1903. To the Porcellidiidae are assigned *Porcellidium tenuicauda*, Claus, 'One specimen dredged off St. Agnes (Scilly) in a depth of 10 fathoms'; *P. fimbriatum*, Claus, and *P. viride* (Philippi), both from St. Mary's.¹⁶ In the Idyidae stand *Scutellidium tisboides*, Claus, found 'on weeds in Porcessa Bay,' and *S. fasciatum* (Boeck), also from the Scilly Islands.¹⁷

To the Thaumatoeessidae (otherwise called Monstrillidae) belongs *Monstrilla rigida*, Thompson, to the Corycaeidae *Corycaeus anglicus*, Lubbock, both rare species, recorded by Vallentin from Falmouth.

Under the Ascidicolidae Canu brings the species *Notodelphys allmani*, Thorell. Cocks records this as *N. ascidicola*, Allman; but Allman's specific name has been rejected by later authors on the ground that under it two or more species had been inextricably confused together. To the Asterocheridae belong *Dyspontius striatus*, Thorell, and *Acontiophorus scutatus* (Brady and Robertson), 'both dredged in a depth of 40 fathoms off St. Agnes.'¹⁸ In Giesbrecht's opinion the puzzling *Nicotthoe astaci*, Audouin and Milne-Edwards, should stand near to this family. It is parasitic 'on the gills of the common lobster,' as recorded by Cocks, who supposes himself to have discovered a variety, which, however, he does not describe. That industrious collector further gives the names of nine species of the Copepoda commonly known as fish-lice, some of which attain a much larger size than what is common in the free-living species. Their vagaries of form no doubt add some difficulty to the study, but at the same time they stimulate observation by their oddness and help to lift this particular

¹ *Ann. Nat. Hist. Ser. 7*, vol. xv, 284.

² *Ibid.* p. 70.

³ *Ibid.* p. 84.

⁴ *Ibid.* pp. 92, 94, 97.

⁵ For the species of *Thalestris*, see *Mon. Brit. Cop.* vol. ii, pp. 123-139.

⁶ *Ibid.* p. 142.

⁷ *Ibid.* pp. 166-168.

⁸ *Ibid.* p. 73.

⁹ *Ibid.* p. 86.

¹⁰ *Ibid.* p. 100.

¹¹ *Ibid.* p. 149.

¹² *Ibid.* pp. 177, 180.

¹³ *Mon. Brit. Cop.* vol. ii, p. 67.

¹⁴ *Ibid.* p. 79.

¹⁵ *Ibid.* p. 88.

¹⁶ *Ibid.* pp. 108, 119, 114.

¹⁷ *Ibid.* pp. 152, 155, 164.

¹⁸ *Ibid.* vol. iii, 67, 71.

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group above the level of the commonplace. The family Caligidae have a broad depressed carapace, uncinat second antennae, second maxillae and maxillipeds; the stiliform mandibles are included within a suctorial beak; the ovisacs are a pair of cord-like tubes. In the genus *Caligus* (O. F. Müller), though not in that exclusively, the frontal border has a pair of 'lunulae,' often mistaken for eyes. Cocks gives the following record: *Caligus diaphanus*, Nordmann, cod and haddock, fish market; *rapax*, M. Edwards, haddock and whiting, fish market; *Mülleri*, Leach, haddock, cod, etc., fish market, with the remark added: 'It is the common opinion that it is the *Caligi* which force the salmon from the sea up rivers towards the waterfalls, Müller.' The species which especially attacks the salmon is *Lepeophtheirus salmonis* (Kröyer), belonging to a genus devoid of frontal lunulae, but *Caligus rapax* includes the salmon among its numerous victims. *C. mülleri*, Leach, and *C. diaphanus*, Baird, are now accounted synonyms of *C. curtus*, O. F. M.¹ Cocks records '*Pandarus bicolor*, Leach. From the skin of the *Carcharius gleucus*.' The name of the host should be *Carcharias glaucus*. He gives '*Cecrops Latreillii*, Leach, from the *Orthogoriscus mola*, by Arthur Chard, jun., fisherman.' The specific name of the huge, strangely truncate sun-fish, on which this large copepod is only one of many parasites, should be not *mola*, but *mola*. To this family also belongs a remarkable parasite which Milne-Edwards described in 1840 as *Phyllophora cornuta*, from a specimen taken at Tongatabu. The generic name alluded to the leaf-like plates on the creature's back, but being preoccupied it has just been changed to *Phyllothyreus* by Norman, who says: 'I may take this opportunity of announcing this interesting species as a member of the British fauna. It has been known to me for more than forty years. It was sent to me by William Laughrin at a time when I was employing that old coastguardsman to collect fish parasites for me. He said that he had found it on the blue shark at Polperro.'²

In the Chondracanthidae the males are minute, and the females have the body completely or indistinctly segmented, often with irregular lobes and prolongations. To this family belong two species recorded by Cocks as '*Lernentoma asellina*, Linn., attached to gills of tub-fish (*Trigla hirundo*, House. — *Lophii*, Johnston. From a *Lophius piscatorius*; beach, near Boyer's cellars.' The former has recently been placed in a new genus by Mr. Bassett-Smith, so that it now stands as *Oralien asellinus* (Linn.); the latter is *Chondracanthus lophii* (Johnston).³ I cannot find any Mr. House as an authority on tub-fishes, and conjecture, therefore, that Cocks in the above quotation could give no more precise locality for the fish than his own home at which he examined it. The Lernaeidae, while young, even if sexually mature, are not specially abnormal, but 'in the older and fixed parasitic condition the females are long, worm-like, generally without limbs, some with irregular excrescences from the anterior portion, others with elongated appendages from the genital segment or abdomen.'⁴ Cocks reports '*Lerneonema encrasicoli*, Turton, attached to the eye of a young pollock, fish-stall, Back hill.' Bassett-Smith transfers this to the genus *Lernaeenicus* (Lesueur),⁵ a name which the author of the genus spells *Lerneanicus*. *Encrasicolus* was Willoughby's name for the anchovy. Lastly, Cocks gives '*Lerneia branchialis*, Linn. Removed from the gills of the haddock, by Miss Vigurs,' adding: 'Kröyer states that he observed a singular phenomenon when he touched an individual (*L. branchialis*); it squirted from the vent a transparent stream of fluid to the distance of a foot and a half, and this it repeated several times one after another.' The generic name as written by Linnaeus himself is *Lernaea*. The passage translated from Kröyer occurs in the first volume of his *Naturhistorisk Tidsskrift*, p. 183, published in 1837. Kröyer does not say that the *Lernaea* squirted a stream of fluid, but 'a clear fluid to a distance of a foot to a foot and a half,' which brings the rapid repetition of the discharge within the limits of probability; since each volley might have been a few drops instead of a stream.

The Thyrostraca or Cirripedes are no less indebted than the other groups of Cornish crustaceans to the untiring zeal of Mr. Cocks. It is true that in 1850 he still included them among the Mollusca.⁶ But of this the explanation is simple, namely, that the volumes of Darwin's great monograph were not published by the Ray Society till 1851 and 1854. It would naturally not count for much in conservative England that our own countryman, J. Vaughan Thompson, had led the way some twenty years earlier in proving barnacles to be crustaceans and not molluscs. We must still be grateful to Mr. Cocks for his catalogue, the value of which is not really impaired by its misplacement in classification. The simplest way of dealing with it will be to interpolate in square brackets the names preferred by Darwin in his monograph, and supply occasional notes. Of the sessile Thyrostraca, Cocks gives the following list:—'*Genus Balanus*. *Balanus communis*, Mont. [*B. perforatus*, Bruguière]. On rocks, stones, etc., Barpoint, Castle, Gwyllyn-vase, Swanpool, etc., common; very large on the Black rock, from $\frac{3}{4}$ of an inch, to $1\frac{1}{2}$ of an inch in length. — *larvis*,

¹ See Bassett-Smith, *Proc. Zool. Soc. Lond.* (1899), p. 447.

² *Ann. Nat. Hist.* (1903), Ser. 7, vol. xi, 368.

³ *Proc. Zool. Soc. Lond.* (1899), pp. 490, 494.

⁴ *Ibid.* p. 480.

⁵ *Ibid.* p. 484.

⁶ 'Contributions to the Fauna of Falmouth,' in *The Seventeenth Annual Report of the Roy. Cornw. Polyt. Soc.* 1849, pp. 75-77.

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Brug.—Parasitical on the *Anatif. laevis*, and *A. laevis*, *Var.*, taken from the bottom of a vessel from Black Sea. — *balanoides*, Mont. [(Linn.)]. On rocks, stems of the Lam. digit., shells, Crustacea, cork, Penryn Creek, Bar, Castle, Gwyllyn-vase, Swanpool, etc.: common. — *Cornubiensis*, Penn. [*B. perforatus*, Bruguière]. Covering rocks, Patel. vul. etc., in multitudes, Barpoint, Castle, Gwyllyn-vase, Swanpool, Pennance, etc. — *Var.* (*B. Punctata*, Mont.) [*Chthamalus stellatus* (Poli)].¹ In some localities: very common. — *depressa*, Cocks. [Poli has a var. *depressa* of his *Lepas stellata*].² On polished and flat surfaces, viz. slates, insides of broken bottles, jars, oyster shells, and stems of Lam. digit. etc., not uncommon. On cork: rare. — *pusillus*, Cocks [not known to Darwin, or Weltner in 1897]. Attached to wood, and old cork floats, from deep water: not common. Rocks, shells, Castle: very rare. — *costatus*, Donovan. [? *B. porcatus*, da Costa].³ Attached to stems of the Lam. digit.; from deep water; on old and well-seasoned cork floats, Gwyllyn-vase, Penzance, and Bream bay: rare. — *rugosus*, Mont. [? *B. crenatus*, Bruguière]. On wood, stones, shells, cork, etc., from deep water: rare. — *Var.* Mont. On wood, cork, roots of Lam. digit. from deep water; not uncommon on the beach, stormy weather. — *tintinnabulum*, Linn. Two living specimens on a piece of (wreck) timber, washed on the beach, Castle, in the year 1844. Procured three living, and more than fifty dead, shells, December 1848, Bar beach. The schooner, *Mary*, of Dartmouth, from Acra, coast of Africa, went on the rocks under the Rev. W. J. Coope's house, Gwyllyn-vase, Dec. 7, 1849: attached to her bottom and sides were magnificent specimens of the Bal. tintinnabulum, 2½ inches in height, and 2¼ inches in diameter [Darwin gives 'basal diameter of largest specimen very nearly 3 inches; height of the highest specimen 3 inches'].⁴ *Bal. conoides* [May this be the *B. cornubiensis conico ore minore*, of Ellis, 1758?],⁵ *B. rugosus*, Ost. parasit., etc. — *convexula*, Penn. [apparently not known to Darwin or Weltner]. Several fine and perfect specimens on a cork-float, Pennance: rare. — *spinosus*, Cocks. Shell truncated, elliptic, diaphanous, composed of six pieces, transversed by opaque white, longitudinal striae; aperture large, edge entire, smooth; operculum, composed of four valves of a reddish purple colour; shell and operculum covered with vitreous-like spines; size ⅓ of an inch; on a cork float (from deep water), sands, Gwyllyn-vase: very rare. [The description, which has been overlooked by succeeding authors, as it well might be, embedded thus in a faunistic catalogue, is rather suggestive of a young specimen of the later published *Balanus improvisus*, Darwin, var. *assimilis*].⁶ — *elongatus*, Mig. [Darwin gives *B. elongatus*, Auctorum variorum, among the synonyms of *B. crenatus*, Bruguière, and *B. balanoides* (Linn.). Cuvier uses Mig. as short for Félix Miger]. On the rocks, Castle, low-water mark: not uncommon. — *rugosus*, Macg. [Cocks takes no note of the circumstance that he has already accorded '*B. rugosus*, Mont.']. On the rocks, Castle, low-water mark, and near the magazine: not uncommon: — *angulosus*, Macg. [Darwin gives *B. angulosus*, Lamarck, as a synonym of *B. porcatus*, Bruguière]. On the rocks, Castle, low-water mark, and at Pennance, etc., but local. — *fistulosus*, Macg. [*B. balanoides* (Linn.)]. On the rocks, Castle, low-water mark, at Pennance, etc., but local. — *clavatus*, Macg. [Synonym of *B. crenatus*, Bruguière, or *B. balanoides* (Linn.)]. On the rocks, Castle, low-water mark, at Pennance, etc., but local.

'Genus *Acasta*. Lam. *Acasta Montagu*, Leach. [*A. spongites*, Poli]. Found embedded in sponge, from deep water; very rare. — *Var.*—Free of spines and a flat base; on the sands, Gwyllyn-vase, Pennance, Bream Bay, etc., after stormy weather in autumn and spring: not uncommon.

'Genus *Creusia*. *Creusia striata*, Lam. [Under *C. spinulosa*, Leach, Darwin notes *C. striata*, Chenu, as a species too insufficiently described for recognition].⁷ On stones, shells, cork, stems and roots of Lam. digit.: very common. — *Var.*: not uncommon.

'Genus *Pyrgoma*. Sav. *Pyrgoma Anglicum*, on shells, stones, etc., low-water mark: not uncommon. On the Caryophylli[a] Smithii, from deep water; very common' [the species is *G. B. Sowerby's*, the genus *Pyrgoma* was instituted by Leach].

Of the Pedunculate Thyrostraca Cocks mentions the following: 'Genus *Anatifera*. Lam. [*Lepas*, Linn.]. *Anatifera laevis*, Lam. [Synonym of *Lepas anatifera*, Linn., or of *L. billii* (Leach)]. Attached to the bottom of vessels, wood, cork, charcoal, cocoanut husk, or sepiae, feathers, etc.: Custom house quay, Bar sands, Gwyllyn-vase, Pennance, Bream bay, etc.: not uncommon. — *Var.*: Shell ventricose, plates, with ribs coarse and strong, point of ventral plate, (very) obtuse, edge of mantle and cirri bright yellow, pedicle short, coarse and corrugated; some of the specimens were covered with the *Laomedea geniculata*; from the bottom of a vessel from the Black Sea. [It is not improbable that both the species and the variety here described may be *Lepas pectinata*, Spengler, for which Darwin gives a list of attachments similar to that detailed by Cocks, and which Cocks himself subsequently records as *L. sulcata*]. — *anserifera*, Linn.—Bottom of vessels, logs of wood, portions of wrecked timber, etc., not common. — *fascicularis*, Mont. [Ellis and Solander.] Attached to gull feathers, cork, *Fucus serratus*, etc. (Nov. 7th, 1845), procured more than 100 living specimens,

¹ See Darwin, *Balanidae*, p. 455, and compare pp. 267–8 on *B. balanoides*.

² Ibid. p. 456.

³ Ibid. p. 231.

⁴ Ibid. pp. 256, 493.

⁵ Ibid. p. 250.

⁶ Ibid. p. 198.

⁷ Ibid. p. 382.

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attached to *Fucus serratus*, covered with *Sertul. pumila*, *Laomedea Geniculata*, and *L. gelatinosa*, Nov. 12th, 1847, hundreds were thrown on the sands, Gwyllyn-vase, Pennance, etc. — *sulcata*, Mont. [*L. pectinata*, Spengler]. On cork, feathers, or sepiae, etc.: not common. I removed several young ones (May, 1849) from the bottom of a vessel from Leghorn (In Col. Montagu's specimens there were only fifteen ribs; Mr. Couch's, twenty-eight in one and twenty-nine in another; and in some of mine there are thirty-eight to forty ribs), Gwyllyn-vase, Swanpool, Pennance, Bream bay, etc.

'Genus *Pollicipes*. Lamarck. [Leach]. *Pollicipes mitella*, Chenu. [*Pollicipes mitella* (Linn.)]. From the bottom of the schooner *Mary Ann*, of Jersey, laden with oil, from Gallipoli, Naples, Jan. 5th, 1850, dead specimens from beach, near custom-house quay. — *scalpellum*, Lam. [*Scalpellum vulgare*, Leach]. Attached to *Sertularia polyzonias*, *S. nigra*, *Gorgonia verrucosa*, etc., deep water, trawl refuse: common.

'Genus *Cineras*. Leach. [*Conchoderma*, Olfers]. *Cineras Cranchii*, Leach. [*Conchoderma virgata* (Spengler), for which *C. virgatum* should be read]. Bottoms of vessels: not uncommon.

'Genus *Otione*. Leach. [*Conchoderma*, Olfers]. *Otione Cuvieri*. [Darwin gives *Conchoderma aurita* (Linn.), for which *C. auritum* should be read]—attached to bottoms of vessels from the Black Sea, Egypt, Leghorn, etc., Custom-house quay, bar sands: not uncommon.

'Genus *Alepes* Rang. *Alepes parasita*, Lesson. [Sander Rang]. Attached to umbrella of the *Cyanea tuberculata*, Pennance sands, Aug. 1845. In 1846, two from the bottom of a brig from Odessa, Custom-house quay.'

From Darwin's own work the following notices may be taken:—Concerning *Balanus porcatus*, da Costa, he says, 'Mr. Jeffreys, who knows this species well, has found it common on the extreme southern shores of England.'¹ On Bate's authority he reports *Alcippe lampas*, Hancock, a member of the Lepadidae, from south-eastern shores, off the Eddystone Lighthouse.'² In discussing *Alepes parasita*, he says that it 'has been always taken on Medusae,' and does not reconcile this with the apparent exception of which he had been informed by Mr. Cocks.³ On the attachment of *Scalpellum vulgare* Darwin remarks that 'Specimens are attached to various horny corallines, and occasionally to the peduncles of each other,' with a footnote, 'Mr. Peach (*Transact. Brit. Assoc.* 1845, p. 65) states that this is sometimes the case in Cornwall; and I have seen a similar instance in a fine group from Naples.'⁴ When dealing with the 'complemental male' of this species, Darwin acknowledges his great indebtedness 'to Mr. Peach for his unwearied kindness in procuring me fresh specimens.' He had some dozen specimens from Cornwall, on all, or nearly all of which there were these 'parasitic males.' Only on very young specimens they never occur. 'On a Cornish specimen, with a capitulum a little more than one-fifth of an inch in length, it may be mentioned as unusual that there were three males. In young specimens there is generally one male on each scutum, but sometimes there are two, and sometimes none on one side. In large old Cornish specimens I have counted on the two sides together, six, seven, and eight males, and in one Irish specimen no less than ten, seven all close together on one valve, and three on the other, but I do not suppose that these were all alive at the same time.'⁵

In bringing to a close this chapter on the Crustaceans of Cornwall I can imagine the mild spirit of modesty suggesting to the author some apology for its inordinate length. What the subject itself more imperiously demands is quite a different attitude—not that I should ask pardon for having written too much, but that I should plead the sense of moderation as my only warrant and excuse for having explained too little. Borlase compared the form of the county to a cornucopia. It has proved to be indeed a cornucopia in regard to its crustaceans, and, while that is true of those already known, there can be no doubt that before long the 'horn of plenty' will be found to contain many more species than as yet it has yielded to science.

¹ *Balanidae*, p. 258.

² *Ibid.* p. 530. The name *Alcippe* being preoccupied, Norman in *Ann. Nat. Hist.* (1903), Ser. 7, vol. xi, p. 369, substitutes *Trypetesa*.

³ *Lepadidae*, pp. 159, footnote, 164.

⁴ *Ibid.* p. 226.

⁵ *Ibid.* 240.

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In consequence of the geographical features of Cornwall, the peninsula being surrounded on three sides by the sea, and having a great extent of coast-line in proportion to its terrestrial area, marine fishes occupy a large and important place in its natural history, and play an important part in its economics. In numbers of individuals its waters are scarcely as productive as those of the North Sea, but in number and diversity of species they are surpassed by few if any other parts of the British or Irish coasts. Projecting in a south-westerly direction into the Atlantic Ocean, the peninsula extends into the area of distribution of several southern species, for example the pilchard, which are rare or wanting in other parts of Britain ; and wanderers or visitors of other southern or oceanic species, more frequently reach the coasts of Cornwall than other coasts of the British Isles. On the other hand, species of northern distribution, as for example the haddock (*Gadus æglefinus*) and the viviparous blenny (*Zoarces viviparus*), are rare or absent from Cornish waters.

Until lately the county has been fortunate in the number and enthusiasm of its local ichthyologists. In the earlier half of last century Dr. Jonathan Couch at Polperro studied the local fishes with unremitting attention, and his observations, first published in occasional papers, are collected for the most part in his complete work on the *Fishes of the British Islands* (1862-5). He also published special details on Cornish fishes in the *Cornish Fauna* in 1838, of which a second edition, with the fishes revised by T. Cornish, was published in 1878.

R. Couch and T. Cornish made observations at Penzance, which were recorded in the *Zoologist*. Cocks noted remarkable captures at Fal-mouth. During a long lifetime at Mevagissey the late Matthias Dunn studied the natural history of marine fishes with remarkable success, and added to the fish-lore of the county by the information and specimens which he supplied to J. Couch, to Dr. Francis Day, and in his last years to the Plymouth Laboratory, even more than by his own communications to the scientific societies of the county and his other publications.

Among marine fishes the pilchard is the most characteristic fish of Cornwall : it occurs in great abundance off the coasts of this county, and extends to the south coast of Devon, but is absent or extremely scarce on all the other coasts of Great Britain. The pilchard is the same species of fish which is called the sardine in France. Its habitat extends from Cornwall and the south coast of Ireland to the neighbourhood of Madeira and throughout the Mediterranean. In the waters of the Atlantic however

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the fish reaches a larger size, and therefore two races have been distinguished, the oceanic sardine and the Mediterranean sardine : the former reaches the length of 10 or even 11 inches, while the latter seldom exceeds $7\frac{1}{2}$ inches.

The sardines which are sent to England preserved in oil in air-tight tins, although small fish, are not derived from the Mediterranean, but are the young of the oceanic race. They are from 5 to 7 inches long, and are caught on the west coast of France from Brest to Bordeaux, and also on the Atlantic coasts of Spain and Portugal. On the French coast these small sardines appear in great numbers in summer from May to November.

The pilchards caught in Cornwall are from 7 to 10 inches in length, usually 8 or 9 inches. These larger fish are also caught on the French coast in winter.

It would naturally be presumed that the smaller fish would occur also on the Cornish coast, and, in fact, that is the case to a certain extent. But pilchards under 7 inches in length are usually so scarce in Cornish waters that it would be impossible to depend upon a supply of them for manufacture. In some seasons they are abundant in November and December in the neighbourhood of the Rame Head, and at times thousands of them are caught in the seines, but their occurrence is very uncertain. The present writer when holding a post under the Technical Instruction Committee of the Cornwall County Council was authorized to carry out a systematic series of experiments with French small-meshed nets and the French method of fishing, and the experiments were continued for two seasons in Mount's Bay, Falmouth Bay, at Looe and Mevagissey, but without any more success than is indicated in the above conclusions.

It has been conclusively established that the summer sardine caught off the French coast is immature, and it is probably a year old. The study of the reproduction of the mature sardine was found to be difficult, as fish containing ripe spawn were seldom caught. Of the vast numbers caught by the fishermen of Cornwall very few show any marked signs of the reproductive condition. It was ultimately ascertained that ripe pilchards are usually only to be found at a considerable distance from the coast. In fact, the habits of the fish are the reverse of those of the herring : pilchards approach the coast in order to feed, and go seawards when about to spawn. Matthias Dunn observed years ago that the ripe but unfertilized spawn floated in a bucket of sea-water, and at the Plymouth Laboratory the present writer proved that the fertilized spawn was normally buoyant, and possessed features which made it easy to identify the ova when collected from the sea. It was found that such ova occur constantly in the sea off the south coast of Cornwall and Devon from May to September.

The history of the investigations concerning the spawn of the pilchard is somewhat curious, and a brief summary of it may be of interest. Matthias Dunn's observation, made in 1871, that pilchard eggs floated in

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sea water, has already been mentioned. In 1888 Raffaele, an Italian zoologist working at Naples, described buoyant ova from the sea with certain peculiarities, and suggested that they belonged to the sardine. About the same time the present writer working at Plymouth obtained similar ova from the sea, and from comparison of these with ripe but unfertilized eggs taken from the pilchard concluded that they belonged to this species. In the two or three years following Professor Pouchet investigated the question on behalf of the French Government at Concarneau in Brittany, with the object of throwing some light on the cause of the failure of the French sardine fishery at that time. He refused to believe that the eggs of the sardine were buoyant, and maintained that there was no evidence that the fish spawned near the coast at all. At the same time Professor Marion at Marseilles from his own observations supported the conclusions published by Raffaele and the present writer. The question was finally settled in 1893, when the present writer obtained living spawn actually taken from pilchards and artificially fertilized, and found that the ova agreed in every respect with those previously assigned to the species. The spawn thus obtained was actually hatched. The development of the young pilchard was also traced at Plymouth, and the young fish only 2 to 3 inches long were obtained from the stomachs of mackerel in November 1891, and from the Hamoaze in September 1893.

In former times, until about the year 1883, pilchards annually visited the north coast of Cornwall, especially St. Ives Bay, in autumn in large shoals, but at present they are seldom found in abundance on this part of the coast, where herrings have taken their place.

It is impossible to decide from any evidence at present available what is the cause of this change in the migrations of the pilchard. It would appear that there is on the north coast of Cornwall an alternation of pilchard periods and herring periods, and it is natural to surmise that this is due to some alternating change in the physical conditions of the sea. As the Cornish coasts form the northern limit of the range of the pilchard, it seems possible that in certain periods the drift of warm water from the south extends further to the north, and that the pilchard then extends its wanderings to the north coast of Cornwall, while in other periods the drift of warm water is weaker or takes another direction, and that for this reason the north coast is deserted by the pilchard and visited by the herring. The present writer attempted to get evidence upon this point by comparing observations of the surface temperature of the sea taken by fishermen at various parts of the coast, but constant differences supporting the above suggestion were not discovered.

It might be suggested that the change is due to the increase of drift-net fishing, but this does not seem probable, for it is difficult to see how this method of fishing could at the same time cause an increased abundance of herrings.

The estuaries of Cornwall are broad and long, but the fresh waters above the reach of the tide are for the most part narrow and of limited

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extent. Hence the freshwater fishes are not abundant either in species or individuals. Salmon and peal are regularly fished in the Camel and Fowey, but the freshwater trout are small, and a number of freshwater species common in central England, as, for example, the pike (*Esox lucius*, Linn.), the roach (*Leuciscus rutilus*, Linn.), the chub (*L. cephalus*, Linn.), the bream (*Abramis brama*, Linn.) are entirely absent.

An asterisk prefixed to the name in the following list indicates a freshwater species ; two asterisks denote occurrence in both fresh and salt water.

TELEOSTEANS

ACANTHOPTERYGII

- *1. Perch. *Perca fluviatilis*, Linn.

Stated by Borlase in 1758 to be unknown in Cornwall, but according to J. Couch was introduced in the last century.

- **2. Sea Bass. *Morone labrax*, Linn. ; *Labrax lupus*, Day.

Common, and often of large size. Large shoals are sometimes seined near Sennen Cove at the Land's End. It is also taken in seines at other parts of the coast, and is caught by hook and line. It often enters the estuaries, e.g. Helford river, the Tamar, etc.

3. Comber. *Serranus cabrilla*, Linn.

First obtained by J. Couch at Polperro ; occurs frequently at Mevagissey ; recorded by T. Cornish from Mount's Bay (*Zool.* 1866).

4. *Epinephelus æneus*, Geoffr.

Under the English name dusky perch and the scientific name *Serranus gigas*, Cuv., J. Couch in his *British Fishes* described and figured a specimen 3 feet long taken with a line near Polperro about the year 1830. Day gives a description and figure under the same names, his figure being taken from a specimen sent from the museum at Berlin. Later ichthyologists, namely Moreau, *Poissons de la France*, and Doderlein, *Mediterranean Ichthyology*, have identified the figures of both Couch and Day as representing a fish of the species *Epinephelus æneus*, Geoffr., and not *Serranus gigas*, and this conclusion is confirmed by Dr. G. A. Boulenger (*Brit. Mus. Catalogue*, ed. 2, vol. i.) J. Couch states that two other specimens of *S. gigas* were obtained by Cocks at Falmouth, one of which was sent to the British Museum, and R. Q. Couch (*Zool.* 1846) stated on the authority of Mr. E. Chirgwin that two other specimens had been caught in Mount's Bay. Whether these other specimens were of the same species as Couch's or not it is impossible to decide, as nothing is known at the British

Museum of a specimen from Falmouth. *Epinephelus æneus* occurs in the Mediterranean, and on the west coast of Africa, but has not yet been found on the coasts of Portugal or the west coast of France.

5. Stone Bass. *Polyprion americanus*, Bl. Schn. ; *P. cernium*, Day.

First recorded in British waters by Couch, who obtained it at Polperro. Reported in 1845 as common between Land's End and the Scilly Isles. Mr. Dunn sent one from Mevagissey to the Plymouth Laboratory in 1892 ; Mr. Cornish obtained one at Penzance in 1878. This fish is often called the wreck-fish from its habit of following wreckage, apparently in order to feed on the barnacles with which floating timbers are usually covered. Mr. J. B. Cornish gaffed one near wreckage off Newlyn in 1893 (*Rep. Penz. Nat. Hist. Soc.* 1893-4).

6. Maigre or Shade-fish. *Sciæna aquila*, Lacép.

According to Day this fish is often taken off the coasts of Devon and Cornwall in summer and autumn. He mentions records of one in 1843 taken off Mevagissey which was 6 feet long ; in 1844 one taken off Fowey ; in 1863 one at Penzance recorded by Cornish, and a small one in 1881 taken in a trammel at Mevagissey.

7. Four-toothed Gilt Head. *Dentex vulgaris*, Cuv. & Val.

A Mediterranean species of which occasional wanderers have been taken on the south coast. Two obtained by Cocks at Falmouth in 1846 and 1851 are recorded in J. Couch's *British Fishes*.

8. Black Sea Bream. *Cantharus lineatus*, Montagu.

Couch records two at Polperro, and Mr. Cornish others at Penzance. The latter observer states that one 7½ inches long was taken at Penzance in May 1880, and a

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young specimen only $6\frac{1}{2}$ inches long was taken by Mr. Holt in July 1897 at the mouth of the Lynher or St. Germans river in the Hamoaze.

9. Bogue. *Box vulgaris*, Cuv. & Val.

The first specimen in British waters was obtained at Falmouth in 1843 in a seine. Several others have been obtained at the same place. In March 1873 a specimen 12 inches long was taken in Helford river.

10. Common Sea Bream. *Pagellus centrodontus*, De la Roche.

Common all round the coast. The young are called chad, though these are often supposed to be of a distinct species. Chad take a bait very freely in summer and autumn. Large bream are often abundant at the Runnelstone Buoy near the Land's End.

11. Spanish Bream. *Pagellus bogaraveo*, Brunn.

Not very rare, but only single specimens are taken, usually with hook and line.

12. Axillary Bream. *Pagellus owenii*, Günther.

Has been recorded from Cornwall.

13. *Pagellus acarne*, Cuv. & Val.

A specimen in the British Museum from Cornwall; it was in Leach's collection.

14. Pandora Sea Bream. *Pagellus erythrinus*, Linn.

Common. Day states that the young were abundant at Mevagissey in August 1880.

15. Couch's Sea Bream. *Pagrus orphus*, Risso.

According to Day the only undoubted British specimen was one obtained by Couch about two miles south of Polperro, and described by him as a new species. The specimen was 20 inches long and 6 lb. in weight.

16. Gilt-Head. *Pagrus auratus*, Linn.

Another rare visitor. Mr. Cocks obtained two in the Falmouth market in 1846. In 1870 Mr. Cornish recorded one $18\frac{1}{2}$ inches long, taken at Penzance in a mullet net (*Zool.*)

17. Red Mullet. *Mullus barbatus*, Linn.; var. *surmuletus*, Linn.

Common, but not very abundant. In March they are found some miles out at sea, and are taken by the trawlers. After June they come close in shore and are taken in

ground seines; they are also caught with trammels and set-nets. In Helford river the owners of yachts catch them in considerable numbers with trammels.

The plain mullet, *M. barbatus*, is the Mediterranean form, the striped mullet the form found in the Atlantic and off the south coast of England. It is doubtful whether the plain form has ever been taken in Cornwall.

18. Ballan Wrasse. *Labrus maculatus*, Linn.

Very common on rocky shores among seaweed. It is very variable in colour, the commonest coloration being brown or greenish with a bright blue or white spot on every scale. Specimens taken in *Zostera* may be of a uniform green; the *L. lineatus* of Donovan is a variety of a green colour with yellow streaks. The var. *L. comber*, Gmel., has dark transverse bars dorsally, and a white band along the side. But Mr. Holt has shown that the same individual can change its colour in a short time.

19. Cook or Cuckoo Wrasse. *Labrus mixtus*, Linn.

Fairly common, but usually in deeper water than the ballan wrasse. The colours of the male are very brilliant, red with blue stripes. The female is yellow, with three black spots on the hinder part of the back.

20. Conner. *Crenilabrus melops*, Linn.

Very common.

21. Jago's Goldsinny. *Ctenolabrus rupestris*, Linn.

Common. Mevagissey, Mount's Bay and elsewhere.

22. Scale-rayed Wrasse. *Acantholabrus palloni*, Risso.

Two specimens recorded by J. Couch; one taken in 1830 at Deadman Point in upwards of 50 fathoms of water; the other was 10 inches long.

23. Rock Cook. *Centrolabrus exoletus*, Linn.
Not uncommon.

24. Rainbow Wrasse. *Coris julis*, Linn.

A Mediterranean species of which the female is dull coloured, and has been described as a separate species under the name *C. giofredi*. A male, a little over 7 inches in length, was taken in Mount's Bay in 1802, and came into the possession of Donovan.

*25. Miller's Thumb. *Cottus gobio*, Linn.
Common in rivers.

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26. Father-lasher, Short spined Bull-head. *Cottus scorpius*, Linn.

This species is the northern form, and is comparatively rare on the Cornish coast.

27. Long-spined Bull-head. *Cottus bubalis*, Euphr.

Very common in rock pools and near the shore, and also in deeper water. The ordinary specimens are black or dark brown, with yellow patches, but specimens are sometimes obtained from deep water in which these colours are replaced by red and white. Day mentions such a specimen obtained at Mevagissey.

28. Grey Gurnard. *Trigla gurnardus*, Linn.
Abundant on the trawling grounds.

29. Piper. *Trigla lyra*, Linn.
Fairly common.

30. Tub or Sapphirine Gurnard. *Trigla birundo*, Linn.

Common and valuable, but less abundant than the grey gurnard.

31. Streaked Gurnard. *Trigla lineata*, Gmel.

A somewhat rare species first obtained by Mr. Jago in Cornwall. Mr. Cornish stated that he obtained twenty-nine at Penzance from 1858 to 1866 (*Zool.* 1866). Mr. Holt (*Journ. M.B.A.* v. 109) says this is called the Polperro bull-dog at Plymouth, and is one of the commonest gurnards of the district in deep water, and that it was taken on one occasion in Cawsand Bay.

32. Red Gurnard or Elleck. *Trigla cuculus*, Linn.

Common on the trawling grounds.

33. Lanthorn Gurnard. *Trigla obscura*, Linn.

Mr. Cocks obtained specimens at Falmouth and Helford river. It only occurs occasionally. It is common in the Mediterranean.

34. Pogge or Armed Bull-head. *Agonus cataphractus*, Linn.

Rare, but occurs occasionally.

35. Armed Gurnard. *Peristethus cataphractus*, Gmel.

Was taken in 1849 in Mount's Bay. J. Couch records two taken off Gorran, and another from Penzance.

36. Lumpsucker. *Cyclopterus lumpus*, Linn.

This is distinctly a northern species, common in Greenland and absent from the Mediterranean. It can scarcely be said to be

a resident of Cornwall, and I know of no record of its spawning there. Wanderers however are occasionally taken. Mr. Cornish records in the *Zoologist* a male full of milt, of the size and colour of a female, taken in a mackerel drift net off Penzance in March 1873, and two females captured in the same way in 1876. J. Couch also mentions that they are occasionally taken in drift nets at the surface. This is not in accordance with their structure and usual habits, but indicates that they sometimes swim in open water. Mr. J. B. Cornish records both a male and a female at Penzance in 1894 (*Zool.* 1894).

37. Sea Snail. *Liparis vulgaris*, Flem.

Also a species of northern latitudes. Rare in Cornwall; has been taken at Falmouth.

38. Montagu's Sucker. *Liparis montagui*, Cuv.

Occurs, but is not abundant.

39. Two-spotted Goby. *Gobius ruthensparri*, Euphr.

According to Day it is rather rare in Cornwall, but is probably fairly common in *Zostera* and *Laminaria* beds. Holt states that it is fond of laying its eggs inside the bulbous roots of *L. bulbosa*. This naturalist has recently published an excellent revision of the British and Irish Gobiidæ (*Rep. Fisheries of Ireland for 1901*, pt. II. *Scientific Investigations*; *Dep. Agricul. and Tech. Educ. Ireland*, 1903).

40. Willughby's Goby. *Gobius paganellus*, Gmel.

Abundant among rock-pools and under stones between tide marks, and on rough ground in shallow water.

41. Rock Goby. *Gobius niger*, Linn.

Common in estuaries. According to Holt the name rock goby is not very appropriate, as it occurs on comparatively clean muddy or sandy ground from tide marks to a depth of a few fathoms.

- 41A. Giant Goby. *Gobius capito*, Cuv. & Val.

This species is distinguished from *Gobius paganellus*, which it most resembles, by the following peculiarities: (1) The anterior membrane of the united ventral fins forms a pointed lobe on each side; (2) the eyes are smaller and the width between them greater. The species is well known in the Mediterranean and is common at Marseilles. In 1899 it was discovered for the first time by Mr. Boulenger on the west coast of France in the Gulf of St. Malo. Couch stated that his

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largest specimens of *Gobius niger*, up to 9½ inches in length, were found in rock pools above the reach of ordinary tides, and Mr. Boulenger suggested that these large specimens might have been really *Gobius capito*. In August 1903 Mr. Pickard-Cambridge found such large gobies in the rock-pools at Portscatho east of Falmouth, and they were identified by him and Mr. Boulenger as *Gobius capito*, which was thus added to the British fauna. The fish when adult is from 7 to 10 inches in length, much larger than any other species of goby. It is thus evident that Couch saw specimens of this species but erroneously identified them as *Gobius niger* (see *Field*, 24 Oct. 1903, where figs. are given).

42. Freckled Goby. *Gobius minutus*, Linn.

According to Holt there are two main races of this variable species. One is the typical form, *G. minutus major*, which is larger but more slender and reaches 3½ inches in length. This is found on open coasts down to about 50 fathoms. The second race is estuarine and is identical with the *G. parnelli* of Day; it is stouter in build but smaller, not exceeding 2½ inches in length. The largest and most brightly coloured specimens came from the clean and sandy estuaries of the north of Cornwall, the smallest and most dingy from the muddy and brackish estuaries of the North Sea.

43. Painted Goby. *Gobius pictus*, Malm.

Abundant on the south coast of the county.

44. Jeffreys' Goby. *Gobius jeffreysii*, Günther.

This is a deep water species ranging from 19 to 180 fathoms. It has been found near the Eddystone, and probably occurs further west also.

45. *Gobius scorpioides*, Collett.

This is one of the smallest fishes known. It was first described by Collett in 1874; two specimens were obtained off the coast of Norway and one in the Cattegat. The longest was not quite 1½ inches in length. In July 1897 Mr. Holt obtained a specimen in Falmouth Harbour at a depth of 18 fathoms. It was a mature female. He has since found it plentiful in Ballynakill Harbour in Ireland.

46. Transparent Goby. *Aphia pellucida*, Nardo.

Abundant in Cawsand Bay in July, and probably at other parts of the coast. According to Collett it is an annual species, reaching maturity in one year and dying after breeding.

It was also taken in April 1897 in the Lynher river, above Waterlake to Anthony Passage, in company with young herrings of similar size. Also in Kiln Bay, Tamar river.

47. Crystal Goby. *Crystallogobius nilssonii*, Dub. & Kor.

Abundant in the deeper part of Falmouth Bay, forming, as probably on other offshore grounds along the coast, the chief food of half-grown dories and large scald-fish.

48. John Dory. *Zeus faber*, Linn.

Common. Larger specimens are taken by the trawlers in deep water, small ones occur in shallow water in summer.

49. Boar-fish. *Capros aper*, Linn.

In the early part of the nineteenth century this fish was regarded as a rarity; in 1842 a specimen was found on the beach at Brighton and sent to the Queen, when the Prince Consort identified it as *C. aper*. In later years many records were published in the *Zoologist*. At the present time the fish is abundant in summer on the trawling grounds from the Start to the Lizard, and also off Mount's Bay.

50. Trumpet Fish. *Centriscus scolopax*, Linn.

A Mediterranean species of which specimens have rarely been found on British coasts. Day states that one undoubted example was thrown on shore at Menabilly near Fowey in 1804, and recorded in the second edition of Pennant's *British Zoology* in 1812.

51. Mackerel. *Scomber scombrus*, Linn.

The chief fishing season for mackerel off the coasts of Cornwall is the spring, from the beginning of March to June. At this time a fleet of several hundred boats, steam and sail, makes its headquarters at Newlyn, while others are fishing from St. Ives, Falmouth and Mevagissey. The fish are found about the Scilly Isles, north of St. Ives, and in the English Channel. They spawn in May and June and the eggs are buoyant. In summer and autumn mackerel approach the shore, and are caught, though in smaller numbers, by hook and line and by the seine. In winter the Cornish boats fish for them off Plymouth.

52. Spanish Mackerel. *Scomber colias*, Gmel.

A Mediterranean species of which occasional specimens occur off Cornwall.

53. Short-finned Tunny. *Thunnus thynnus*, Linn.

Mr. R. Couch considered these fish to be common off west Cornwall and the Scilly

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Isles, and Day states that they were abundant off Cornwall in 1840. They are occasionally taken in the mackerel and pilchard nets.

54. Germon or Long-finned Tunny. *Thunnus germon*, Lacép.

According to Day has been twice taken in Mount's Bay, the last time in 1846.

55. Pelamid. *Pelamys sarda*, Bloch.

Several specimens have been recorded by Dunn, Couch and Cornish, taken at Mevagissey, Polperro, Mount's Bay and other places, but have sometimes been mistaken for *Thunnus thynnus*.

56. Plain Bonito. *Auxis rochei*, Risso.

Specimens recorded in 1843 and 1844 at Looe and Mount's Bay.

57. Sucking-fish. *Echeneis remora*, Linn.

Mr. Dunn obtained a specimen, which he gave to J. Couch, from a blue shark taken eighteen miles off the Deadman, near Mevagissey. As the blue shark is common off the Cornish coast, it is possible that the sucking-fish frequently accompanies it.

58. Scabbard-fish. *Lepidopus caudatus*, Euphr.

Day mentions several records for Cornwall, beginning with two specimens taken in Mount's Bay. Cocks, in *Rep. Roy. Cornwall Polyt. Soc.* 1869, described one taken near Falmouth at Gyllyng Vase which was 53½ inches long. J. Couch stated that he had records of four taken in Cornwall, one of which was 64 inches long.

59. Silvery Hair-tail. *Trichiurus lepturus*, Linn.

J. Couch figures the first authentic British specimen of this species; it was 2 ft. 3 in. long and was thrown ashore at Whitsand's Bay near the Land's End in 1853. Since then a large number have been recorded as obtained in Cornwall. According to Matthias Dunn they were common in the winter months from 1865 to 1875, but scarce before and since that period. In 1867 one was taken in a mackerel net in Mount's Bay, and Mr. Cornish recorded others subsequently (*Zool.* 1867, 1871, and 1872). Specimens have also been recorded from Looe and Helford river (Hardwicke, *Sc. Gossip*, 1872). One was taken in 1876 in St. German's river (Gatcombe, *Zool.* 1876).

60. Sword-fish. *Xiphias gladius*, Linn.

In August 1878 a specimen 8 ft. 7 in. long and weighing 138 lb. was taken by hook and line in Mount's Bay (Cornish, *Zool.* p. 351).

61. Ray's Bream. *Brama raii*, Bl. Schn.

This fish seems to live in rather deep water in the Atlantic and is occasionally thrown on shore or found in shallow water after storms. There are several records from Cornwall. R. Couch (*Zool.* 1846) stated that two specimens had been taken at Polperro, and one near the Runnelstone in Mount's Bay. In 1866 (*Zool.*) Mr. Clogg recorded one washed ashore at Looe. In 1874 and 1875 in the same journal Mr. Cornish mentioned two found near or on the beach near Penzance. In March 1891 a specimen about 1 ft. 8 in. long taken with a gaff at the surface near Portscatho, was sent to the Plymouth Laboratory by Matthias Dunn, and examined by the present writer.

62. Opah or King-fish. *Lampris luna*, Gmel.

Also belongs to the deep water of the Atlantic, and has been most frequently taken on the Norwegian coast and the northern shores of the British Isles. A list of captures is to be found in *Rep. Roy. Corn. Polyt. Soc.* for 1869. J. Couch mentions one taken in the west of Cornwall in 1835. In June 1865 a large specimen was taken in St. Austell Bay.

63. *Luvarus imperialis*, Rafin.

This is a Mediterranean species, not common even in that sea. The only British specimens have been taken in Cornwall: one thrown on shore at the Deadman in 1866 and sent by Dunn to Couch, another found floundering in a tide-pool at Falmouth in the same year. The first specimen is in the British Museum, the second was 4 feet in length.

64. Scad or Horse-Mackerel. *Caranx trachurus*, Linn.

Frequently taken in the mackerel nets and sometimes in seines.

65. Pilot-fish. *Naucrates ductor*, Linn.

Celebrated as the companion of sharks, it also accompanies ships, and has often followed the latter into British harbours. Mr. Cocks stated that in 1856 a shoal of these fish appeared at the Custom House pier at Falmouth, and dozens were taken by people on the beach. Mr. Cornish recorded two at Penzance in 1868, two taken in mackerel nets in Mount's Bay in 1873 and another in 1874.

66. Derby. *Lichia glauca*, Linn.

Couch obtained a specimen 13½ inches long taken in a drift net near the Runnelstone in 1857. Mr. Cornish recorded a second specimen taken near Penzance in 1878.

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67. *Lichia vadigo*, Risso.

In the *Report of the Penzance Natural History Society*, 1893-4, Dr. Günther records a specimen of this species 19 inches long taken in a pollack net off Prussia Cove in 1892 (see also *Ann. and Mag. Nat. Hist.* ser. 6, x. 335).

68. Rudder-fish. *Pammelas perciformis*, Mitchill.

The only British specimen was obtained about six miles from Penzance in October 1874 and was recorded by Mr. Cornish (*Zool.* 1874). It was found alive in a floating wooden case of which one board was wanting from the top. Day states that it was preserved in the collection of Sir John St. Aubyn. Mr. Cornish, thinking it was a new species, gave it the name *Pimelepterus cornubiensis*.

Mr. Holt gives an interesting paper on this and other species of the family *Stromateidae* (*Rep. Fisheries of Ireland* for 1901, p. 70), and states that in September 1901 a large shoal of rudder-fish followed a barnacle-covered log which drifted ashore at the Aran Islands. The peasants were so afraid of them that they ran away, believing that they were sheeogues or fairies.

69. Blackfish. *Centrolophus pompilus*, Linn.

Two specimens were taken at Looe in 1721 and recorded by Borlase in his *Natural History of Cornwall*. Couch mentions one taken in 1830, a second on a hand-line near Polperro in 1831, and another came with a ship into St. Ives Harbour and was gaffed. There are several later records. Mr. Gattcombe (*Zool.* 1872) records one taken in a mackerel net off the Deadman, which appeared to have followed a large porbeagle taken in the same net. Mr. Dunn knew of a dozen taken at Mevagissey. Mr. Holt describes six or eight specimens taken in a mackerel net near the Runnelstone in 1891. They were all small specimens between 12 and 14 inches in length (*Journ. M.B.A.* ii. 265).

70. Cornish Centrolophus. *Centrolophus britannicus*, Günther.

This is probably a spurious species. A specimen was thrown on the shore near Looe, obtained by Couch and presented by him to the British Museum, where it was stuffed and the descriptions and figures were taken from the stuffed specimen which, according to Day, is distorted. It was probably a specimen of *C. pompilus*.

71. Greater Weever. *Trachinus draco*, Linn.

Common on sandy ground. Couch mentions that they are sometimes taken in drift

nets, as though they were in the habit of swimming towards the surface at night.

72. Lesser Weever, Viper Weever. *Trachinus vipera*, Cuv. & Val.

Common in sandy bays. In both this and the larger species there is a spine at the upper part of the operculum which is poisonous, and a prick from it causes intense pain for a short time.

73. Dragonet or Skulpin. *Callionymus lyra*, Linn.

Very common. The male is distinguished by its brilliant blue and yellow colouring, and by the great elongation of the rays of the anterior dorsal fin. The eggs are buoyant, and the sexes perform an elaborate courtship.

74. Spotted Dragonet. *Callionymus maculatus*, Bonap.

A fully developed male trawled by Mr. Holt in Falmouth Bay, July 1897, depth 30 to 35 fathoms. Previously known from the Hebrides and the Firth of Clyde, and from the west coast of Ireland. Common in the Mediterranean.

75. Cornish Sucker. *Lepadogaster gouanii*, Lacép.

Common under stones and in pools between tide marks.

76. Double-spotted Sucker. *Lepadogaster bimaculatus*, Flem.

Not so common as the preceding species.

77. Connemara Sucker. *Lepadogaster decandolii*.

J. Couch states that he obtained only a few specimens. In his account of dredging excursions subsidized by the British Association in 1866 he mentions a specimen obtained at 40 fathoms.

78. Cat-fish or Wolf-fish. *Anarrhichas lupus*, Linn.

According to J. Couch has been taken at Looe and Fowey, but it is a northern fish very seldom seen in Cornwall.

79. Gattorugine. *Blennius gattorugine*, Bloch.

Common in rather deep water, and frequently taken in crab-pots.

80. Montagu's Blenny. *Blennius galerita*, Linn.

Common in Mount's Bay between tide marks, and on other parts of the coast.

81. Butterfly Blenny. *Blennius ocellaris*, Linn.

Not uncommon at Falmouth (Cocks), and occurs also in Mount's Bay.

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82. Shanny. *Blennius pholis*, Linn.

Common in rock pools and under stones between tide marks.

83. Crested Blenny. *Carelophus ascanii*, Walb.

According to R. Couch has been frequently obtained, but is rare in Mount's Bay, Cornish having recorded the first at Penzance in 1878.

84. Butterfish or Gunnel. *Centronotus gunnellus*, Bl. Schn.

Common between tide marks.

85. Red Band-fish. *Cepola rubescens*, Linn.

Mr. Dunn recorded it from Mevagissey.

86. Angler, Fishing Frog, Monk-fish, or Sea Devil. *Lophius piscatorius*, Linn.

Common. The spawn is shed in a gelatinous band. The writer has seen some of this spawn brought up on to the deck of a trawler off the Wolf Rock, and Mr. Dunn obtained a band which was floating at the surface off Mevagissey and sent it to the Plymouth Laboratory.

ANACANTHINI

87. Cod. *Gadus morrhua*, Linn.

Plentiful and of good size, but usually somewhat smaller and inferior in flavour to those of the North Sea.

88. Haddock. *Gadus aeglefinus*, Linn.

At present haddock are rare off the Cornish coast. I have not paid particular attention to the point, but if caught at all only single specimens are taken occasionally. Mr. Dunn stated that they were plentiful off Mevagissey until 1870, in weight up to 12 lb., but entirely left the coast in that year. R. Couch observed that they spawned in Cornwall.

89. Bib, Pout, Whiting-pout. *Gadus luscus*, Linn.

Abundant. These fish are often called blens or blinds in Cornwall from the peculiar bulging of the opaque cornea of the large eyes after death.

90. Power or Poor Cod. *Gadus minutus*, Linn.

Equally common with the bib.

91. Whiting. *Gadus merlangus*, Linn.

Abundant, taken by hand lines and also by the trawlers.

92. Poutassou. *Gadus poutassou*, Risso.

Mr. Couch obtained a specimen at Pol-

perro in 1840. According to Matthias Dunn young poutassou were abundant in the neighbourhood of Mevagissey in 1861, 1871 and 1881.

93. Coal-fish. *Gadus virens*, Linn.

In Cornwall this fish is known as the rauning pollack, which appears to mean ravenous pollack. It is often more common than the true pollack, and is of large size. Many are landed by the long-liners at Polperro, and I have caught fine specimens off the Runnel-stone Buoy near the Land's End.

94. Pollack. *Gadus pollachius*, Linn.

Common; caught by the long-lines, and also by amateurs by whiffing and other methods.

95. Norway Pout. *Gadus esmarkii*, Nilsson.

Mr. Matthias Dunn obtained specimens of a *Gadus* unknown to him from the stomach of a pollack caught in a trawl 40 miles north-west of St. Ives. Two of the specimens were sent to the Plymouth Laboratory in 1897 and identified by Mr. Holt as *G. esmarkii* (*Journ. M.B.A.* v. 79). The species had been previously found off the west coast of Scotland and the west coast of Ireland at depths between 26 and 144 fathoms. In August 1900 Mr. Garstang identified a specimen taken in a ground seine between Saltash and the Lynher river. This specimen was about 7 inches long.

96. Hake. *Merluccius vulgaris*, Cuv.

A characteristic Cornish fish, but accounts agree in stating that it is much scarcer now, especially in inshore waters, than it used to be. It is a fish which ranges to deep water, and the steam trawlers landing at Plymouth and Milford Haven catch very large numbers at the mouth of the English Channel, and even in the Bay of Biscay.

97. Greater Fork-beard. *Phycis blennioides*, Bl. Schn.

J. Couch considered this species rather common in Cornwall, but Mr. Cornish states that it is rare; he obtained one at Penzance in 1864 and one at the Land's End in 1870. In 1873 one was taken in a herring net at Looe. In 1892 one was received at Plymouth caught on a whiting hook 5 miles from shore, and according to Holt one has been trawled in Cawsand Bay.

98. Ling. *Molva vulgaris*, Flem.

Common; numbers of large specimens are caught by the long-lines at Polperro and elsewhere.

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99. Five-bearded Rockling. *Motella mustela*, Linn.

Common.

100. Four-bearded Rockling. *Motella cimbria*, Linn.

Cocks has recorded it from Falmouth. Mr. Cornish states that it is small and rare in Cornwall. Holt mentions a specimen taken from the stomach of a hake trawled in or off the Bristol Channel. It was $8\frac{1}{2}$ inches long, and the first ray of the dorsal fin was over 2 inches in length (*Journ. M.B.A.* v. 343).

101. Three-bearded Rockling. *Motella triccirrata*, Bl.

Very common. There are three principal stages in the life history of this fish. In the first stage they are silvery little fish with long pectoral fins which are black at the ends. These are known as mackerel midges and swim at the surface in June. The older fish up to a length of about 6 inches are of a uniform dark colour and are found under stones between tide marks. The adults, which reach a length of 20 inches and are spotted, are found in deeper water.

102. Lesser Fork-beard. *Raniceps raninus*, Linn.

Mr. Dunn has obtained it at Mevagissey, and Mr. Cornish recorded it several times from Mount's Bay from 1863 to 1878.

103. Bearded Ophidium. *Ophidium barbatum*, Linn.

A specimen 10 inches in length from Padstow is in the British Museum.

PLEURONECTOIDEI

104. Halibut. *Hippoglossus vulgaris*, Flem.

This fish is very seldom caught on the Cornish coast, but a few specimens have been recorded. One weighing 102 lb. was obtained at Mevagissey in 1870, and another weighing about a hundredweight was taken on a spiller in Mount's Bay in 1882 (Cornish, *Zoologist*).

105. Long Rough Dab. *Hippoglossoides limandoides*, Bl.

Cocks obtained a specimen at Falmouth.

106. Turbot. *Rhombus maximus*, Linn.

Common, and reaches a large size. The young up to a length of 1 inch or $1\frac{1}{4}$ inches and in process of metamorphosis swim at the surface, and are often to be seen in harbours in May or June, e.g. Mevagissey.

107. Brill. *Rhombus lævis*, Gottsche.

Common, taken by trawlers. The young

are similar to those of the turbot, but smaller, and are found in similar conditions.

108. Common Topknot. *Zeugopterus punctatus*, Bl.; *Rhombus punctatus*, Günther.

Rather common, but not abundant. Day obtained it at Penzance in 1881, and Cornish stated in the *Zoologist* that he obtained forty-eight specimens between 1858 and 1866.

109. One-spotted Topknot. *Zeugopterus unimaculatus*, Risso.

J. Couch alludes to a specimen from the Bristol Channel in 1863, and Cornish obtained one in 1880. It is evidently rarer than the common topknot.

110. Norway Topknot. *Zeugopterus norwegicus*, Günther.

Four specimens trawled in July 1891 between the Eddystone and Rame Head in 25 fathoms. One specimen trawled six miles from Plymouth Breakwater in March 1892. The last specimen was a ripe female. It does not exceed 4 inches in length.

111. Sail Fluke or Megrim. *Lepidorhombus megastoma*, Donovan.

Common on the trawling grounds. The sail-fluke and carter of J. Couch's *British Fishes* are the same species, but it is usually called the megrim in the fish trade. The legend of its floating to the shore in the Orkneys with its tail erected as a sail seems to be founded on fact, as it seems to come to the surface and be thrown ashore there in storms.

112. Scald-fish or Scald-back. *Arnoglossus laterna*, Walb.

Very common on sandy ground, the young in shallow water, the adults on the trawling grounds. The *A. lophotes* of Günther, distinguished by the elongation of the anterior rays of the dorsal fin and of the rays of the pelvic fins, is the adult male.

113. Broad Scald-fish. *Arnoglossus grobmanni*, Bonap.

Two females trawled by Holt in Gerran's Bay, July 1897, both full of spawn.

114. Plaice. *Pleuronectes platessa*, Linn.

Abundant, but not so large as those of the northern part of the North Sea. There are several local races of plaice differing not only in size at maturity, but in minute structural characters; the English Channel race extends to the coasts of Holland, further north is a larger race, while the Iceland plaice and Baltic plaice are quite distinct.

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115. Lemon Dab. *Pleuronectes microcephalus*,
Donov.

Usually called lemon sole in the fish trade. Common on the trawling grounds, scarce in shallow water.

116. Dab. *Pleuronectes limanda*, Linn.
Common.

117. Witch or Pole-Dab. *Pleuronectes cynoglossus*, Linn.

Dunn obtained one at Mevagissey, and Mr. Cornish considers it rare along the Cornish coast. It is a northern species of which only occasional wanderers occur in Cornwall.

- ** 118. Flounder. *Pleuronectes flesus*, Linn.

Very common in the estuaries; descends to the sea in the spawning season, February to May. The young of this species are abundant in the tide pools of Mevagissey Harbour in April and May in various stages of metamorphosis, the youngest being quite transparent.

119. Sole. *Solea vulgaris*, Quensel.

Common and fine. A few young specimens about $\frac{1}{2}$ to $\frac{3}{4}$ inch long occur with the young flounders at low tide in Mevagissey Harbour in May.

120. Lemon Sole, Sand Sole, French Sole.
Solea lascaris, Risso.

This is a true sole quite distinct from the lemon dab, which is called lemon sole by fish dealers. It is at first sight similar to the common sole, but distinguished by the colour and by the dilated fringed nostril on the blind side. It is comparatively rare.

121. Thick-back or Variegated Sole. *Solea variegata*, Donovan.

Common on the trawling grounds.

122. Solenette. *Solea lutea*, Risso.

Common in sandy bays as well as in deeper water. Does not exceed 4 or 5 inches in length, and is often erroneously supposed to be the young of the common sole.

PLECTOGNATHI

123. Spotted File-fish. *Balistes maculatus*, Gmel.

A single specimen in the British Museum stated to have been received from Polperro, but Day thinks this is probably a mistake.

124. File-fish. *Balistes caprisus*, Gmel.

A specimen was taken in 1865 at Porthloe, and came into the possession of J. Couch.

125. Globe-fish. *Tetrodon lagocephalus*, Linn.

A specimen obtained at Penzance 1 foot in length was described in Pennant's *British Zoology* (1776). A specimen from Mount's Bay was recorded by Boase in *Proc. Zool. Soc.* 1833. In 1867 one 19 inches long was taken near Truro, and in 1868 one at Penzance (*Zool.* 1868). Couch, without giving the years, states that one was taken at Polperro, two in Mount's Bay and one at St. Ives. It belongs to the tropical Atlantic.

126. Sun-fish. *Orthogoriscus mola*, Linn.

Large specimens are occasionally captured in summer and autumn. Borlase mentions a specimen from Mount's Bay, and I saw a large specimen a few years ago at Penberth, west of Penzance.

127. Oblong Sun-fish. *Orthogoriscus truncatus*, Retz.

Borlase also mentions this species in his *Natural History of Cornwall* as taken at Penzance in 1743. Couch mentions two taken in Mount's Bay in 1855. One was taken at Charlestown and is in the Truro Museum. In 1883 one was caught in Looe Harbour (Clogg, *Zool.*)

PERCESOCES

- ** 128. Thick-lipped Grey Mullet. *Mugil chelo*, Cuv.

This species is abundant at certain times and places. Large specimens are captured in large numbers at Sennen in winter time by means of seines. They are common about the docks at Falmouth, and in the Swan Pool near that town. In the latter place the water is almost fresh, but the sea water enters at flood tide. The outlet is protected by a grating so that mullet can only enter when small and young.

- ** 129. Thin-lipped Grey Mullet. *Mugil capito*, Cuv.

Day states that he obtained many specimens from the south-west coast, but the present writer has never identified it.

130. Sand Smelt or Atherine. *Atherina presbyter*, Jenyns.

Very common in all the harbours and estuaries.

131. Larger Launce or Sand Eel. *Ammodytes lanceolatus*, Lesauvage.

Common on sandy shores.

132. Lesser Launce or Sand Eel. *Ammodytes tobianus*, Linn.

More abundant than the preceding species.

FISHES

Largely caught with seines at St. Ives for use as bait.

133. Garfish. *Belone vulgaris*, Flem.

A few specimens are usually taken with every catch of mackerel. At Newlyn I found in their stomachs copepods and sand-eels, and I have suggested that the chief function of the long snout may be to probe the sand in pursuit of the latter.

134. Saury Pike or Skipper. *Scombrex saurus*, Bl. Schn.

Large shoals stated by Mr. Dunn to appear annually at Mevagissey in the autumn pilchard season. He considers them to be constantly at war with the pilchards, but it is difficult to see for what reason they should attack the latter. When skippers and pilchards were enclosed together in a seine, thousands of the pilchards had their eyes knocked out, or their heads or bodies transfixed by the beaks of the skippers.

135. Greater Flying-fish. *Exocoetus volitans*, Linn.

R. Couch stated that these fish were not rare in Mount's Bay, and that in 1845 he saw many start out of the water. This however does not amount to identification, and the only authenticated specimen mentioned by Day is one found on the beach at Helford river and given to J. Couch.

HEMIBRANCHII

** 136. Three-spined Stickleback. *Gastroteus aculeatus*, Linn.

The variety *trachurus*, which is marine or estuarine, occurs in Cornwall. The variety *spinulosus*, which has four spines, is also common, and the smooth-tailed form, *G. gymnurus*, probably equally so.

137. Fifteen-spined Stickleback. *Gastroteus spinachia*, Linn.

Common in the estuaries.

LOPHOBRANCHII

138. Broad-nosed Pipe-fish. *Siphonostoma typhle*, Linn.

Common in *Zostera* beds, where it is concealed by its protective resemblance to a frond of the weed.

139. Greater Pipe-fish. *Syngnathus acus*, Linn.

Common, chiefly among *Fucus*.

140. *Syngnathus rostellatus*, Nilss.

This is a species similar to *S. acus* but of smaller size, and has until lately been con-

founded with it. For the distinctions between the two see *Journ. M.B.A.* v. 175. It has been obtained from Cawsand Bay, and is probably common all along the coast.

141. Snake Pipe-fish. *Nerophis æquoreus*, Linn.

Common.

142. Straight-nosed Pipe-fish. *Nerophis ophidion*, Linn.

Common.

143. Worm Pipe-fish. *Nerophis lumbriciformis*, Yarr.

Common under stones between tide marks.

OSTARIOPHYSI

* 144. Carp. *Cyprinus carpio*, Linn.

Occurs in ponds.

* 145. Gold-fish. *Cyprinus carassius*, Linn., var. *auratus*.

In ornamental ponds.

* 146. Gudgeon. *Gobio fluviatilis*, Flem.

Said by J. Couch to have been introduced and to be thriving in some ponds near Penzance, but Mr. Cornish, in the *Cornish Fauna*, ed. 2, said he did not know of it.

* 147. Dace. *Leuciscus dobula*, Linn.

Common in the Tamar and its tributaries (*Cornish Fauna*).

* 148. Minnow. *Leuciscus phoxinus*, Linn.

Common in many of the rivers, but not in all (Couch).

* 149. Tench. *Tinca vulgaris*, Cuv.

Lives in ponds at Trengwainton near Penzance, where they were placed by Sir Rose Price (J. Couch). A common pond fish in Cornwall (*Cornish*).

* 150. Loach. *Nemachilus barbatulus*, Linn.

Common in some rivers.

MALACOPTERYGII

** 151. Salmon. *Salmo salar*, Linn.

Chiefly caught in the Fowey river, the Camel and the Tamar.

** 152. Peal. *Salmo trutta*, Linn., var. *cambricus*, Donovan.

Taken in the same rivers as the salmon, and occasionally in drift or moored nets off the coast.

* 153. Trout. *Salmo fario*, Linn.

The trout of Cornwall, at least in the small streams, belong to the variety *S. cor-*

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nubiensis, Walb., retaining the parr marks usually throughout life, and only reaching 7 or 8 inches in length. They are however fairly abundant, and afford good sport. The streams in west Cornwall are too narrow and overgrown for the artificial fly, and amateurs mostly use insects and woodlice as bait.

154. Anchovy. *Engraulis encrasicolus*, Linn.

Matthias Dunn stated long ago that anchovies were common every autumn off the coast from Polperro to Falmouth, and in 1871 he reported the capture of 150,000 of these fish at Mevagissey, which were used as manure. Usually a few specimens are taken in the pilchard nets, but there is no regular fishery for them, as the supply is not sufficiently constant. In 1891 and 1892 a few hundreds were caught in small-meshed nets employed by the staff of the Plymouth Laboratory off the Rame Head. There is a regular fishery for anchovies in the Zuyder Zee in Holland in summer, and it is believed that they migrate in winter through the English Channel.

155. Herring. *Clupea harengus*, Linn.

Herrings are caught sometimes on the south coast from Looe and Mevagissey, but the more regular fisheries are on the north coast of the county at St. Ives, Newquay, and Port Isaac. The chief fishery is that of St. Ives, which has of late years taken the place of the old seine fishery for pilchards. The fishery lasts from the beginning of October to the end of January, but the chief months are November and December. The fish spawn at the end of the season in Bassett's Bay.

156. Sprat. *Clupea sprattus*, Linn.

Sprats occur in small numbers along the Cornish coasts, but they are not abundant, and there is no regular fishery for them except with ground seines at Saltash and the shores of the Hamoaze.

157. Pilchard. *Clupea pilchardus*, Linn.

Abundant from July to Christmas.

**158. Allis Shad. *Clupea alosa*, Linn.

Occurs on the south coast. Matthias Dunn states that as many as 600 have been caught at one time in a mackerel seine at Mevagissey.

**159. Twaite Shad. *Clupea finta*, Cuv.

According to R. Couch, frequently taken in pilchard and mackerel nets in west Cornwall.

160. *Paralepis coregonoides*, Risso.

A single specimen was taken by hand at Polkerris near Mevagissey, in 1869, by Mr. Dunn, who sent it to J. Couch; the latter presented it to the British Museum. It belongs to the Mediterranean, but is rare even there. The Cornish specimen, in spirit, was 10 inches long.

APODES

**161. Eel. *Anguilla vulgaris*, Turton.

Common, but not abundant. The young, from 2 inches in length upwards, are found on the shore between tide marks, and in freshwater streams in early summer, e.g. at Mevagissey.

162. Conger. *Conger vulgaris*, Cuv.

Abundant; mostly taken on long lines baited with pilchard. All the marketable conger caught are females. The fishermen do not recognize the roe, which is in two bands loaded with fat. The eggs are very small. The males do not exceed $2\frac{1}{2}$ feet in length, and it has been shown by researches at the Plymouth Laboratory that both sexes die after spawning. The ripe fish are not caught, because they do not feed for several months before spawning. The young form known as *Leptocephalus* is transparent, flat, and ribbon-shaped, and has only rarely been obtained.

163. Muræna. *Muræna helena*, Linn.

A specimen 4 ft. 4 in. long was captured on a line at Polperro in 1834, and obtained by J. Couch, who also received information of another caught in a trammel at Fowey in 1866.

GANOIDS

**164. Sturgeon. *Acipenser sturio*, Linn.

Rare in Cornwall according to the *Cornish Fauna*, but no records are given by Day.

CHONDROPTERYGIANS

165. Blue Shark. *Carcharias glaucus*, Linn.

Common on the mackerel grounds in summer, and sometimes entangled in the nets.

A specimen 8 ft. 3 in. long was taken on a line near Fowey in September 1868.

FISHES

166. Tope. *Galeus vulgaris*, Flem.
Not uncommon.

167. Hammerhead. *Zygæna malleus*, Risso.
A specimen is recorded as taken at Newlyn in 1834.

168. Rough Hound or Small-spotted Dogfish. *Scyllium canicula*, Linn.
Very common.

169. Nurse Hound or Large-spotted Dogfish. *Scyllium catulus*, Cuv.
Common, but not so abundant as the preceding. The eggs of this species are found attached to stems of *Laminaria* at low tide at St. Just in Falmouth Harbour.

170. Black-mouthed Dog-fish. *Pristiurus melanostomus*, Bonap.
One specimen 25½ inches long was taken at Polperro in 1834.

171. Smooth Hound. *Mustelus vulgaris*, Müller & Henle.
Common.

172. Porbeagle. *Lamna cornubica*, Gmel.
Has been frequently taken. Dunn recorded a pair taken at Mevagissey in 1881, the male 9½ feet long, the female 8½ feet.

173. Thrasher. *Alopias vulpes*, Gmel.
Not uncommon. Is frequently captured by the mackerel or pilchard nets. A specimen was landed at Cadgwith about the year 1900, and the writer has seen it leap clear above the surface of the sea off Falmouth. Mr. Gatcombe records one 5 ft. 6 in. long taken at Mevagissey on a common whiting hook. In 1878, according to Mr. Dunn, the crew of a trawler reported that they saw a thrasher and a sword fish attacking a porbeagle in Mevagissey Bay.

174. Basking Shark. *Selache maxima*, Gunn.
A specimen brought ashore in Cornwall and described in J. Couch's *British Fishes* measured 31 ft. 8 in. in length. A specimen landed in St. Austell Bay near Menabilly, the seat of the Rashleighs, was 29 ft. 4 in. long, had a mouth 2½ feet wide and weighed 4 tons. The peculiarities of the head of this specimen as shown in a drawing given to Couch led him to describe it as a distinct species under the name *Polyprosopus rashleighanus*, but later authorities consider it to have been *Selache maxima*. A specimen 9 feet long was taken in Mount's Bay in 1870 (Cocks, *Corn. Polyt. Soc.* 1870).

175. Six-gilled Shark. *Notidanus griseus*, Gmel.

In May 1873 one 2½ feet long was taken by baited hook three miles off shore at Mevagissey. In 1846 one 26 ft. 5 in. long was captured at Polperro, and another 6 feet long taken at the same place is in the British Museum.

176. Picked Dogfish or Spur Dog. *Acanthias vulgaris*, Risso.

Abundant; sometimes swarms in such numbers as seriously to interfere with the pilchard and mackerel fishing. At Mevagissey a year or two ago I saw a large number being cleaned and prepared to be sent to market for eating. It is viviparous.

177. *Centrina saviani*, Risso.

A specimen was obtained by Mr. Cornish in 1877 which had been trawled near the Wolf Rock.

178. Spinous Shark. *Echinorhinus spinosus*, Gmel.

A large number of captures of this species in Cornwall have been put on record: one 8½ feet long in 1849 by Cocks at Falmouth; a female 7½ feet long on a line at Polperro in 1867; in 1881 one 6 feet long was caught sixteen miles off the Deadman. Mr. Cornish recorded five taken in Mount's Bay between 1865 and 1881.

179. Angel-fish or Monk-fish. *Rhinasquatina*, Linn.

Common. Taken sometimes in trammels and cut up as bait for crab-pots, also trawled and caught on long lines. It is often 5 or 6 feet long, and is said to reach even 8 feet.

180. Torpedo. *Torpedo nobiliana*, Bonap.

Has frequently been captured. Couch alludes to five taken in one year in Mount's Bay, and two or three which came under Cocks' observation at Falmouth. T. Cornish records one trawled in 1873 between the Lizard and Land's End, and a second near Penzance. In 1881 specimens were taken at Penzance, St. Ives, Falmouth, Polperro and Mevagissey. In the Report of the *Penzance Nat. Hist. Soc.* 1883-4 two are recorded as captured in a ground seine at Porthleven.

181. Common Skate. *Raia batis*, Linn.
Common.

182. Flapper Skate. *Raia macrorhynchus*, Raf.
Occurs.

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183. White Skate, Burton Skate, or Bordered Ray. *Raia alba*, Lacép.
Not uncommon in deep water.
184. Long-nosed Skate. *Raia oxyrhynchus*, Linn.
Has been obtained (Couch).
185. Shagreen Ray. *Raia fullonica*, Linn.
Rare in Cornwall (Couch).
186. Thornback Ray. *Raia clavata*, Linn.
Common.
187. Spotted Ray or Homelyn Ray. *Raia maculata*, Montagu.
Common.
188. Blonde. *Raia blanda*. Holt & Calderwood.
A species formerly confounded with *R. maculata*, Montagu. It is larger and more spiny than the latter: J. Couch's description of *R. maculata*, according to Holt, applies to both species, but was based on a specimen of the blonde.
189. Painted Ray. *Raia microcellata*, Montagu.
Common. T. Cornish states that this form, locally called 'the owl,' is plentiful off Pra Sands in Mount's Bay, and, according to Dunn, it is common at Mevagissey.
190. Cuckoo Ray or Sandy Ray. *Raia circularis*, Couch.
Occurs in deep water on sandy ground.
191. Sting Ray. *Trygon pastinaca*, Linn.
Has been frequently taken. Couch refers to one from Whitsand Bay, Cornish recorded in the *Zoologist* one taken at Porthcurnow in 1870, and Day mentions one at Penzance and two at St. Ives in 1881.
192. Eagle Ray or Whip Ray. *Myliobatis aquila*, Linn.
Stated in the *Cornish Fauna* to have been taken once off Cornwall. Both this and the previous species are viviparous: the 'purse' attributed to *Myliobatis* by J. Couch belongs to a *Raia*.

CYCLOSTOMES

- **193. Sea Lamprey. *Petromyzon marinus*, Linn.
Common, according to the *Cornish Fauna*. Two have been recorded from St. Ives, and Mr. Dunn took one from the stomach of a hake at Mevagissey.
- *194. Lampern or River Lamprey. *Petromyzon fluviatilis*, Linn.
Common in spring in the rivers of eastern Cornwall.
- *195. Planer's Lamprey or Mud Lamprey. *Petromyzon branchialis*, Linn.
Common.

CEPHALOCHORDA

196. Lancelet. *Branchiostoma lanceolatum*, Pall.
Occurs on sandy shores, but is not easily obtained. Couch found his specimen buried in sand under a small flat stone in 1831. The specimen figured by Day was dredged with others at Mevagissey in 1883.

REPTILES AND BATRACHIANS

Though the adder, the grass snake, the blind-worm, the lizard, the newt, the toad, and the frog are better known to the untrained observer than the animals in any other section of the county fauna, they have received very little attention from local naturalists in Cornwall, and there has been but little attempt to discriminate between allied species. Borlase speaks of them in his *Natural History of Cornwall* (1758), Jonathan Couch gives an account of them in his *Cornish Fauna* (1838), and Cocks an annotated list for the Falmouth district in 1849. Since that date the only descriptive county list that has appeared is Cornish's revision of Couch's article in 1878. Possibly on account of this lack of attention the county list save for its casuals is somewhat commonplace.

REPTILES

CHELONIA

[Luth or Leathery Turtle. *Sphargis coriacea*.

Borlase records the occurrence of this turtle, the largest of all existing Chelonians, in the Cornish seas, and speaks of one that weighed nearly 800 lb. In the Appendix to his *Cornish Fauna*, pt. iii, 149, Couch quotes the account from the *Falmouth Packet* of an unsuccessful attempt to capture a very large turtle near Land's End, in August 1839, that probably belonged to this species.]

[Green or Edible Turtle. *Chelone mydas*.

A specimen of the Edible Turtle covered with seaweed and barnacles was taken alive in a drift-net in Mount's Bay, about two miles south of Mousehole Island, on 5 October, 1874. Speaking of this remarkable capture Cornish says, 'This turtle sometimes appears in English waters, washed overboard from ships or out of a wreck, but it is probable that this particular specimen found its way across the ocean naturally (by coming with the current), not only from the state in which it was when taken, but also from the fact that within four days of its capture, *Pimelepteres cornubiensis*, a tropical fish, was taken alive in Mount's Bay, out of a floating packing case, which was covered with barnacles. The fish and the turtle probably floated across the Atlantic in some sort of involuntary company.'

[Loggerhead Turtle. *Thalassochelys caretta*.

The nearest breeding station of this turtle is in the Mediterranean, but it is a casual visitor to the Bay of Biscay, and has been captured several times in the south-west of England. In September, 1896, a specimen weighing 120 lb. was taken by some fishermen about eight miles SSE. of Mousehole.]

LACERTILIA

1. Common Lizard. *Lacerta vivipara*, Jacq.

Widely spread and common in suitable localities throughout the county.

[Sand Lizard. *Lacerta agilis*, Linn.

Borlase mentions this as a county species, and Couch retains it on his list. Cornish never saw a specimen west of Dartmoor, but Miss F. Tripp, the bryologist, refers to it in some MS. Natural History notes as being rare on the moors above Altarnun. The writer has a specimen given to him by Mr. Dingle, who believed it came from near St. Cleer, but there is some uncertainty about its history. So far as can be ascertained there is no undoubted Cornish example in any collection. If it does occur in the county it is either very rare or else very local, and, in spite of its larger size, stouter build, and general appearance, it may, of course, have been confused with the preceding species. Gadow's description of it may be useful for identification:—'A typically-coloured male during the breeding season is grass-green on the sides and suffused with green on the under parts; the sides are dotted with black with whitish eye-spots. The under parts are spotted with black. The adult female is brown or grey above, with large dark-brown, white-centred spots, which are arranged in three rows on each side. The under parts are cream-coloured, with or without black specks.' (*Amphibia and Reptiles*, 554.)]

2. Slow-worm or Blind-worm. *Anguis fragilis*, Linn.

Very common throughout the county.

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OPHIDIA

3. Ringed or Grass Snake. *Tropidonotus natrix*, Linn.
Bell, *Natrix torquata*.

Not uncommon but somewhat local; generally found in damp meadows and about marshy land. It swims well with body partly submerged and head erect, and is capable of climbing low bushes. The largest county specimen handled by the writer measured 3 ft. 3 in. in length.

4. Viper. *Vipera berus*, Linn.

Locally, Longcripple.

Widely distributed and in some districts common. It swims almost as well as the grass snake, but does not take so freely to the water. The largest specimen submitted to the measuring tape during the past seven years was 21 in. long. The variety known as the 'Red viper' is apparently not uncommon.

BATRACHIANS

ECAUDATA

1. Common Frog. *Rana temporaria*, Linn.
Abundant.

[Edible Frog, *Rana esculenta*, Linn.

Though occasionally referred to as a Cornish species this frog does not occur in the county.]

2. Toad, *Bufo vulgaris*, Linn.

Generally distributed and common.

[Natter-jack Toad. *Bufo calamita*, Laur.

Has been several times recorded for the county, probably through mistaken identification. A yellow stripe down the back easily distinguishes it from the common toad.]

CAUDATA

[Both the Great-crested and the Common Smooth Newt have till recently been generally accepted as

members of the county fauna. There are, however, no specimens of either in any available county collection, and none have been seen by recent observers. Though it seems probable that the smooth newt at least may occur in Cornwall both species must be removed from the county list till authenticated specimens have been obtained.]

3. Palmated or Webbed Newt. *Molge palmata*, Schneid.

Bell, *Lissotriton palmipes*.

Locally, Asker, Evat, Eft.

Very common about Truro and Falmouth, and probably generally distributed throughout the county. As Boulenger points out, it may be distinguished 'at all stages of life and at all seasons by the absence of every trace of pigment on the throat, which is of a transparent flesh colour.'

BIRDS

The striking geographical position of Cornwall gives a peculiar interest to the study of its bird life. It naturally emphasizes many phenomena of distribution, and causes the omissions from the seasonal bird population of the county to become in many cases as interesting as the inclusions. It makes the county the theatre of complicated migratory movements, and consequently the recipient of many waifs and strays. It has caused it to become a gathering ground for many migratory species in the autumn where they may linger for days, or even weeks, before moving to their winter quarters in the south.

It confers on the county a remarkably mild and genial climate, that by its influence on food supply, particularly during autumn and winter, naturally attracts the more nomadic species, and adds to the charm of everyday field work the joy and excitement of the unexpected. As the first and last land in England Cornwall offers the first shelter to autumn migrants that after getting beyond the mouth of the Channel are driven back by storms and contrary winds; and the last asylum to birds that during the winter are driven south or west by the severity of the weather, and are either unwilling or unable to make the passage to the Continent.

A cursory examination of the physical features of the county shows that in its diversity of soil and covering, and its happy admixture of land and water, Cornwall is pre-eminently adapted for a most varied ornis. Its 250 miles of coast, its projecting headlands, its rocky islets, and its famous western archipelago, its long sea-walls of seamed and fissured cliff broken by delightfully sheltered combes, its well-watered, well-wooded valleys running down to the sea, its wide and varied beaches, its open bays, its branching estuaries and tidal rivers, its long reaches of sandy dunes, its breezy downs and stretches of heath-land, its magnificent furze-brakes, its wild moorland, its wealth of upland valleys and shady wooded streams, its lofty tors and granite cairns, its high-lying bogland and desolate marshes, its brackish and freshwater pools, its low-lying reed-beds and swamps, its orchards, gardens, woods, its many grades of cultivated land—all these together offer a congenial habitat for every type of British bird. As might be expected, therefore, Cornwall is rich in resident species, and most of the sections are well represented. On account of its position in the extreme south-west, however, there are several noteworthy absentees from its list of breeding birds. Not only does it lie outside the breeding area of such species as the pied flycatcher, lesser redpoll, wry-neck, long and short-eared owls, merlin, golden plover, black-headed gull, and stone curlew, but it is too far west for the nesting of the lesser whitethroat, the nightingale, and the hawfinch, and yet the three breed regularly in the sister county, Devon. The yellow wagtail probably only occasionally ventures across the Tamar to nest, and in the county itself we come across the western breeding limit of the redstart, garden warbler, wood-wren, and tree-pipit, all of which are practically confined to the woods of the Tamar valley. Up till

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fifty years ago the starling, though an abundant winter visitor, was not known to breed in the county. In 1854 a single nest was noticed at Trebartha in the parish of North Hill, and from that time onwards it gradually spread itself all over the county, and now breeds abundantly as far west as Penzance. This year (1905) several nests were found within $2\frac{1}{2}$ miles of Land's End. Forty years ago the great green woodpecker during the breeding season did not venture beyond Lostwithiel; now it is abundant throughout the county, even in the treeless districts of the Lizard and Land's End. Still more recently the greater spotted and the lesser spotted woodpeckers were practically confined to the woods along the Tamar and its tributaries. The former has now reached Penzance, and the latter breeds as far west as Falmouth. From 1842, when it was first found nesting near St. Germans, the Dartford warbler gradually spread westward, and by 1880 had become fairly common in the furze-brakes about Land's End. One or two severe winters unfortunately almost completely exterminated it, and for twenty years it seemed to be lost to the county. Lately it has been re-discovered nesting at Penryn and at Linkinhorne, near Callington. The stock-dove and the rock-dove have also in recent years established themselves as residents in the county, and are gradually creeping westward during the breeding season. The former was first noticed nesting at North Hill in 1885, and the latter at Kilmaur in the early seventies.

For various reasons the general features of autumn migration in Cornwall are much more pronounced than those of the spring and early summer. From the beginning of August till late in October the migratory activity is at its height. Even in the latter half of July the common sandpiper begins to gather along the coast, and the swift to assemble in favoured localities; while occasional whimbrel and bunches of passing oyster-catchers put in an appearance. The earliest of the summer migrants to leave our shores is the adult cuckoo. After the middle of July one rarely sees an adult bird, at least in the middle of the county, though young birds are in evidence till October. It appears to collect in some numbers at the Lizard before departure, but for the most part, like many other birds, it slips away unnoticed. During the month of August departing summer guests, like the whitethroat, the willow-wren, the spotted flycatcher, the sand-martin, the swallow and the wheatear leave their nesting quarters and gradually draw together in anticipation of their journey south. By the middle of the month the swift has gone, leaving only a few stragglers behind, and by its close the sand-martin and spotted flycatcher have begun to depart. Among our resident birds, the common sandpiper and oyster-catcher become much more plentiful along the coast; the dunlin is much in evidence in the estuaries and on mud-flats, and mistle-thrushes, pied wagtails, and goldfinches collect together on congenial gathering grounds. Among the birds of passage the whimbrel is in most years fairly abundant throughout the month; the sanderling puts in an appearance at Helford about the third, and becomes gradually common; the turnstone and the knot appear in the second week, and the white wagtail almost invariably occurs among the early flocks of the pied wagtail. Before the end of the month the black-headed gull usually descends on our shores in considerable numbers, and solitary specimens of another winter visitor, the redshank, are generally reported from the south coast.

BIRDS

The month of September witnesses the exodus of most of our summer migrants. Large and small flocks and scattered companies of departing and passing sand-martins, white-throats, willow-warblers, spotted flycatchers, ring-ouzes, wheatears, chiffchaffs, swallows, house-martins, and occasional small detachments of corncrakes, tree-pipits, blackcaps, and towards the close of the month of whinchats, garden-warblers, sedge-warblers and redstarts are reported from various localities on the south coast, the most favoured in order of importance being Mount's Bay, the Lizard, Swanpool, Portscatho, and Looe. Before the end of the month the sand-martin and spotted flycatcher have completely disappeared, and in ordinary years only a few willow-wrens and ring-ouzes are left. All the other numerically important summer migrants continue with us in diminishing numbers during the month of October, and odd specimens of the others just mentioned are recorded in the first half of November. Stray specimens, or at the most, small parties of the wood-warbler, grasshopper-warbler, reed-warbler, and nightjar have been seen or obtained on migration in September and October, and in the case of the reed-warbler twice in November, apparently always in the company of other migrants.

During the month of September wide-spread movements are in process among the resident species. Large flocks of pied wagtails, chaffinches, linnets, greenfinches, skylarks, meadow-pipits and goldcrests enter and leave the county ; while, as a rule, the song-thrushes, wrens, coots, mallards, teal, and particularly the starlings, receive reinforcements from the outside. The most interesting winter visitor of the month, though generally occurring singly, is the black redstart, which in some years continues to arrive irregularly throughout the winter. A few wigeon may put in an appearance, and the advent of one or two jack-snipe heralds the approach of the great autumnal migratory invasion from the north-east. Among the birds on passage are the curlew-sandpiper, the green sandpiper, the yellow wagtail, the black tern, and occasionally the wry-neck and dotterel, in addition, of course, to the whimbrel, knot, sanderling and turnstone.

The great event in October is the inrush of winter visitors. The summer migrants have now practically left the county, with the exception of the house-martin, swallow and wheatear, large numbers of which may still linger on. By the middle of the month the last flock of martins departs ; by the twentieth the swallows, too, have vanished, except for small companies and stragglers; and before the close the last of the wheatears has disappeared. By the time the swallows and martins leave us the great migratory stream from the north-east has become fully established, and from northern and north-central Europe sweeps diagonally across England into this far corner, bringing not only our typical winter visitors like the fieldfare, redwing, golden plover, jack snipe, woodcock, siskin and brambling, but large flights of snipe, and immense flocks of lapwings, starlings, larks, and occasionally of thrushes and warblers, and naturally a number of waifs and strays that have been caught up in the migratory rush, and carried far away from their normal lines of flight. Probably most of the birds brought to the county in this great stream continue their journey with or without a pause, but large numbers of course settle down for the winter.

During the month of October nearly all our other winter visitors arrive,

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though several of them receive accessions during the winter, probably as the result of adverse weather elsewhere. The majority of our ducks are most abundant during frost, but in the average years wigeon are fairly common by the close of the month, and the shoveler, scaup, and common scoter have all put in an appearance, the first-mentioned at times in considerable numbers. The red-breasted merganser, purple sandpiper, divers and great-crested grebe are generally reported before the beginning of November, as also are the hawfinch, snow-bunting and short-eared owl. The fire-crest has thrice been identified in October, but seems to arrive as a rule in November, or later, often in the company of gold-crests. The stone-curlew, for which bird Cornwall appears to be the northern winter limit, is rarely seen till November. Among the birds of passage the sanderling is still in evidence; the wood-sandpiper is occasionally obtained, and the bar-tailed godwit often lingers on our mud flats till far into November; the grey plover can generally be seen during the month on Marazion beach; the grey phalarope is rather uncertain in the time of its appearance, sometimes showing itself in the early part of September, in other years not recorded till the middle of November.

Lapwings, golden plover, jack-snipe and full-snipe continue to arrive throughout the month of November, and stray bitterns are not infrequent. Severe weather in the winter months usually causes extensive invasion, and during a hard frost the Lizard and Land's End districts become the temporary refuge of an incredible number of redwings, fieldfares, thrushes, blackbirds, starlings and larks. Both surface-feeding and diving ducks, too, become at times very plentiful. When the severe weather extends over a large area and is long-continued, the white-fronted, the bean-, and the bernacle-goose may locally become fairly common, and both the whooper and Bewick's swan may appear in small flocks in our estuaries and sea-side pools.

In spring the migratory movements are not nearly so pronounced as in the autumn months. Large numbers of birds, especially of the resident species, appear to steal away quietly, and in such loose formation that their departure is not noticed. It is obvious, also, that the majority of the returning birds travel by another route, probably further to the east, where the sea passage is so much shorter. Evidently, too, on account of the relatively much greater width of the sea between Cornwall and the Continent, the incoming of the summer migrants and the transit of the spring birds of passage is feeble compared with the rush that occurs in the south-eastern counties.

Of the fifteen species recorded in the county list as birds of passage, six occur regularly during autumn migration only: namely the grey phalarope, bar-tailed godwit, greenshank, green sandpiper, grey plover, and black tern. The grey phalarope in fact has been only once recorded in the spring, and up till four years ago the black tern had not been observed half a dozen times altogether during that season. Of the remainder, the knot, though at times a fairly conspicuous feature in autumn, is as a rule a scarce bird in the spring; the yellow wagtail, though seen every year in March and April, never occurs in flocks, as it occasionally does at the Lizard and St. Ives in the autumn; and the white wagtail is decidedly scarcer in spring than it is in August and September. The whimbrel, sanderling, wood-sandpiper, and the migrating turnstones, on the average of the last six years, seem to be about as numerous

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in spring as in autumn. The dotterel is a regular passer-by in small numbers in spring, but a rare bird in autumn. It must be remembered, however, that its spring route was only discovered a few years ago, and it is quite possible its line of flight in autumn has escaped observation. There are, moreover, only two spring birds of passage that are practically absent in the autumn, namely the hoopoe, a regular visitor from March to April or May, only occasionally seen in August and September; and the golden oriole, which occurs every year in the west of the county from about the middle of April till the beginning of June, and has so far not been with certainty recorded for the autumn months at all.

An examination of the casuals and vagrants that have been obtained in the county gives some idea of the extent and variety of the immigration in autumn as compared with spring. It is quite true that strange birds are much more likely to be shot in the autumn and winter than in spring and summer, but this alone would not account for the difference. Of the 70 species of Cornish casuals 22 have been obtained during the period of autumn immigration only, 25 during the winter only, when the incoming of birds is largely a question of weather, 5 during autumn and winter, 8 during both autumn and spring migration, 7 during spring immigration only, and 3 in spring and summer. In other words, 35 species have occurred in autumn, 30 during winter, 18 during spring, and 3 during the summer months. Similarly, of the 65 Cornish vagrants, 27 have occurred exclusively during autumn immigration, 15 during the winter, 4 during both autumn and winter, 9 during both autumn and spring immigration, 7 during the spring alone, 2 in summer, and 1—the two-barred crossbill—is uncertain; that is to say, 41 species have occurred in the autumn, 19 in winter, 16 in spring, and 2 in summer. These figures include the Scillonian as well as the mainland waifs and strays.

Spring migration begins among the resident species whose numbers have been increased during the winter. In February, when the weather is normal, starlings, goldcrests, larks, and rooks move to the east or north-east, occasionally in large flocks. The snipe, too, begins to leave, and so also do detachments of chaffinches, greenfinches, linnets, song-thrushes and meadow-pipits. Of the winter visitors the woodcock is among the first to go, and is not often seen after the early days of March. By the end of February departing flocks of fieldfares are occasionally seen, and small companies of redwings.

In March the easterly migration of the starling, goldcrest and finches still continues. Pied wagtails, too, begin to move, and flocks of a thousand or more have been reported from Bude in the beginning of the month. Flights of chaffinches, linnets and wagtails, companies of up to forty or fifty goldfinches, bullfinches and stonechats, and at times fairly large mixed flocks of the smaller birds come in on the south coast. The groups of dunlin disappear from our estuaries, and several other shore birds diminish in numbers. Sanderling completes its passage before the end of the month, and as a rule does the white wagtail, which, as in the autumn, seems almost always to occur in flocks of the pied wagtail. Among our winter visitors the redwing and fieldfare continue the movement begun in February, and the jack-snipe, golden plover, black-headed gull, and great crested-grebe begin to go. After this month the great northern and red-throated divers become as a rule very scarce, and the short-eared owl is not often reported. The most interesting feature,

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however, of March migration is the advent of the summer migrants. The first to appear is usually the chiffchaff, sometimes the wheatear, and every now and again the willow-warbler, the earliest county record for the three being 2 March, 21 February, and 20 March respectively. The chiffchaff, the wheatear, and another March immigrant, the sand-martin, are generally well represented by the end of the month, but the willow-warbler is rarely much in evidence till the middle of April. The blackcap has once been obtained as early as 5 March, and has been reported several times from Calstock between the 20th and 26th of the month, but these dates appear to be quite exceptional.

Spring migration is naturally most active during the month of April. Of the resident species the chaffinch, linnet, goldcrest, wagtails, and other small birds still continue to be reported as coming in on the south coast, and occasionally a small flock of rock-pipits. The teal and remaining snipe that have wintered with us depart. Fieldfares and jack-snipe complete their migration early in the month, and by its close only an occasional redwing is left in the county. Wigeon, shovelers, scoters, and red-breasted mergansers disappear before the end of the month. Black-headed gulls and golden-plovers still continue to leave, often in fairly large flocks, and the purple sandpipers are rarely seen after the third week. Among the birds of passage the turnstones and sometimes the whimbrels are numerically the most important, though by far the most interesting is the hoopoe. This bird is by no means scarce, and it is not uncommon to have as many as twenty recorded in a single season. The golden oriole, a more social bird than the hoopoe, generally comes to us in May, but stray specimens have been seen at Penzance and by the Fal before the middle of April.

The most popular feature of April migration is, of course, the coming of such well-known summer migrants as the cuckoo, swallow, house-martin and swift. The earliest authentic appearance of the cuckoo on the Cornish mainland is 2 April. At St. Mary's, Scilly, Dorrien-Smith saw one on 30 March, 1904, and the same or another bird was seen near the same spot by several observers two days later. As it is generally silent on first arriving it usually escapes observation. Its incoming is in most years recorded by the middle of April. The earliest date for the arrival of the swallows is 21 March, for the house-martin the 31st, and for the swift 8 April. The swallow is abundantly distributed before the middle of April, the martin by the end of the month, and the swift by the first week in May. In the first half of the month small flocks of ring-ouzes and common sandpipers come in on the south coast, whitethroats appear in considerable numbers, and occasional companies of tree pipits are observed. In the third or fourth week small parties of whinchats and sedge-warblers have been occasionally recorded. On 29 April, 1904, a flock of about thirty garden-warblers, along with various other small birds, came in at Looe—the only time this species has actually been seen on migration in the spring. Throughout the month large flocks of wheatears are not uncommon on the south coast. During the first week in May the wood-warbler, nightjar, and corncrake return, and large flocks of arctic and common terns are frequently reported on the south coast, with now and again a flight of sandwich terns. By the middle of the month our latest summer migrant, the spotted flycatcher, ventures across the Channel. Of our winter visitors

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small flocks of immature black-headed gulls, a few golden-plover, and occasionally a few redshanks, may still linger on. The only important bird of passage is the whimbrel, which in some years is very plentiful. Occasional knots and wood-sandpipers are also seen, and of late years a flight of black terns may linger in the west. The latest incoming birds at this season of the year are swallows, flocks of which have been recorded on the south coast, not only in the latter part of May, but as late as 9 June. These are probably on their way to nesting sites on the northern limit of their breeding area.

Recent investigation has shown that land birds on migration avoid high-lying ground, adhere more or less closely to well-defined routes, often skirt the general shore-line for great distances, enter the land at regular openings on the coast, and when passing overland usually follow the direction of river valleys. The usual routes or flight lines of Cornish birds on migration appear to be somewhat complex. In the great autumnal invasion from the north-east many birds undoubtedly come into the county from Devon, but there is at the same time an important flight-line down the coast of the Bristol Channel. Systematic notes for the north coast, however, are still unfortunately somewhat scanty.

The county lies too far away to participate in the great east-to-west rushes from the Continent that are so conspicuous a feature during the autumn months in the eastern counties, and consequently there is an absence of several east-coast casuals and vagrants, such as the blue-throated warbler, the barred-warbler, the icterine-warbler, Pallas's warbler and the great spotted cuckoo. Still it receives considerable accessions from birds that are migrating down the Channel both along the English and French coasts, and it seems probable that many of our casuals, as well as birds of a higher status from northern and central Europe, come to us, not across England, but along the western shores of the Continent. Both in the Channel and beyond it birds on autumn migration at times encounter heavy gales, particularly from the south-west, and are driven back on to the Isles of Scilly and the Cornish mainland, and especially into that great bay that stretches from Land's End to the Lizard. Most of the birds so driven on to our shores in the autumn are resident species, summer migrants and birds of passage in Cornwall, and cannot as a rule be distinguished from those belonging to the county, except when waifs and strays of an exceptional character are associated with them. It is probably due to the disturbance of coastal migration down the west of the European mainland by adverse weather, that we receive the fire-crest practically every autumn or winter. The occurrence of such vagrants at Scilly as the yellow-browed warbler, lesser-shrike, woodchat, ortolan-bunting, short-toed lark, little ringed-plover, tawny-pipit and red-breasted flycatcher, as well as of various unexpected accidental visitors on the south coast of the Cornish mainland as far east as St. Austell Bay is evidently due to the same cause.

A remarkable feature among accidental visitors in the autumn and winter to the western half of the county is that no less than eighteen of the species are American. It is difficult to believe that these birds, with the possible exception of one or two individual cases of 'assisted passage,' could have come across the Atlantic. The usual explanation of the presence of such species in Western Europe is that the birds lose their way in the far north, and

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travelling along the border of the Arctic Ocean in the company of normal migrants till they reach the north of Norway, turn southwards along the west coast of Northern Europe. That these birds cross England with the great migratory stream from the north-east is incredible, as such wanderers occur much more frequently in Cornwall than in the counties over which such a route would lie, and in which indeed most of the species have not been recorded at all. Of the six examples of Bonaparte's gull recorded for the United Kingdom, three have occurred in the south of Cornwall; of the three solitary sandpipers so recorded, one was obtained at Scilly, and one at Marazion Marsh; of the nine Bartram's sandpipers, three have been shot at the Lizard; of the three yellowshanks, one was shot at Marazion; of the two killdeer plover, one occurred at Scilly; of the four American stints, one was obtained at Marazion and one at Penzance; while the little green heron shot near St. Austell in October, 1889, is the sole European representative of this species from tropical and temperate America. It is remarkable that of the forty-two indisputably Cornish examples of the American species, thirty-one, including eighteen from Scilly, have been obtained to the west of a line drawn from Godrevy lighthouse to St. Michael's Mount, four from the Lizard, six from the immediate neighbourhood of Falmouth, and only one, the little green heron already referred to, from further east in the county. This suggests either that they have migrated down the Channel and been driven back, or else that wandering round by the north of Scotland they have come down the west coast, either through the Irish Sea, or round by the west of Ireland, and so struck the westernmost portion of the county. Some, no doubt, have come by the latter route, but as only four out of the twenty-four American birds that have been obtained on the Cornish mainland were captured on the north coast, and no less than twenty on the south, one may conclude that the Channel route is the usual one.

Many flocks and irregular flights of birds come in from the north, both at Hayle and at Scilly; but there is little to indicate where they originated, or by what route they have travelled, and migratory records at both stations are still unfortunately meagre. During autumn and winter flocks of starlings, larks, redwings, thrushes and various undetermined land birds have been observed at Scilly coming in from the north-west, on two occasions against a fairly stiff south-easterly breeze, so that it is more than likely birds cross over from the south-east of Ireland to the west of the county, but to what extent this is a genuine annual migration is at present uncertain.

The routes or flight-lines adopted by our emigrant birds in autumn are towards the south, the south-west, and the west. Occasional flocks are reported by fishermen in the Channel as moving towards the south-east, and the St. Ives fishermen at long intervals observe very large flocks moving towards the north-west. There is, of course, a very considerable east-to-west movement at times between the mainland and the Isles of Scilly, and in the late autumn immense numbers of starlings, larks, redwings, fieldfares and other birds pass over these isles, particularly at night, in a westerly direction that if persisted in must carry them right into the Atlantic!

In spring the immigrants come in from the south-west, the south, and the south-east. Coasting flocks are occasionally noticed on the south moving

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from east to west, and at intervals on the north coast in the opposite direction. In the west birds have been reported coming in from the north-west. Mount's Bay, the Lizard, Swanpool, the Fal, Fowey, and Looe are all favourite landing places. Flocks are often reported coming in at the Land's End, Portscatho, and Par, while many birds spread westward from the Tamar. Several comparatively scarce birds pass up the Pentuan valley every spring, while the Looe valley, the Fowey, and the Fal, with its many creeks and tributaries, are regular highways for birds passing into the county.

The county may be divided provisionally into seven ornithological districts:—1. The Bodmin Moors; 2. The Bude and Camel district; 3. The St. Columb-Camborne district; 4. The Tamar-Fowey district; 5. The Truro-Falmouth district; 6. The Lizard and Land's End; 7. The Isles of Scilly.

I. THE BODMIN MOORS

These form a wild, irregular plateau of hill land, rising here and there into lofty, often granite-crowned tors, with elevated expanses of treacherous bog and rough marsh-land. Many of the hill-sides are irregularly strewn with granite boulders. The great stretches of coarse, shaggy, faded grass by their monotony give in places an aspect of peculiar desolation. On the moors themselves there is little cover of any kind, save what is offered by the brakes of gorse and fern and heather, and by the occasional reed-beds. Though Dosemary Pool is the only important sheet of water in this wild upland country, the moors are the great collecting-ground for the waters of the Camel, the Fowey, the Lynher, the Inney and the Attery. These rivers and their tributaries have carved for themselves valleys, often of exquisite beauty, down the side of the plateau. Only the higher rills and streams of course belong to the moorland proper, but even into the moorland valleys the dipper, grey wagtail, and marsh-tit ascend, and where there is gorse we find the linnet, stonechat, long-tailed tit, willow-warbler, and nightjar.

In bygone days the moors were a great resort of birds of prey, but now only the buzzard and the kestrel are left. On the southern moors Montagu's harrier nested till about 1830, but has very seldom been seen during the last sixty years. The kite bred at Tolvern Wood till about 1835, and on the moors above St. Neot till 1842 at least, but the last recorded casual was shot in 1869. The marsh-harrier bred in Redmoor Marsh till 1855, but is now a rare autumn casual. In the forties the rough-legged buzzard bred between Jamaica Inn and Bolventor. The last known nest was destroyed on Gonzion Downs in 1858 or 1859, and since then the bird has never with certainty been seen on the moors again. The hobby nested in woods on the south and east of the moors in 1844, 1859, 1862, and probably in 1869, so that it also may have been a regular summer migrant. It is still a not infrequent summer casual.

In the seventeenth and eighteenth centuries the black grouse or heath-poult was abundant, and as late as 1816 fourteen were killed in one day between the Cheesewring and Jamaica Inn. For the last fifty years, however, it has been perilously near extinction. The spotted crake bred at Crowdy Marsh in 1860, and again in 1874. There is a strong suspicion

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that the green sandpiper occasionally breeds on the moors about Trewortha Marsh, but no nest has ever been found.

The most characteristic moorland birds in summer are the wheatear and ring-ouzel. The former is fairly common on the granite-strewn hill-sides, the latter still breeds in small scattered colonies among the rocks and heath of the higher tors. The snipe, curlew, lapwing, mallard, teal, coot, moorhen, water-rail, and meadow-pipit all breed regularly on the moors, though some of them are by no means abundantly represented. The dunlin, too, nests in small numbers in the marshes round Brown Willy and Roughtor, and on the moors and turf-pits between St. Neot's stream and the Upper Fowey. The golden plover has never been known to breed, though birds with fully developed plumage may be seen in the month of May. The common sandpiper nests among the old streamworks by the Upper Fowey, and wherever there are old sand-banks on the moors. The raven is not so scarce as it was fifteen years ago. The stock-dove breeds abundantly on one or two of the granite tors, often in the company of the swift.

During the winter the moors are dreary and desolate. Bird-life in general is scarce, and small birds are almost entirely wanting. In the average winter, snipe, jack-snipe, woodcock, lapwing, and golden plover are usually well represented. Teal are fairly plentiful, and wigeon at times abundant. Duck, too, often occur in considerable numbers, particularly at the beginning and at the close of severe weather, while pintail and golden-eye are not uncommon during frost. The spotted crane is occasionally flushed on the snipe marshes, and the merlin is a regular winter visitor.

2. THE BUDE AND CAMEL DISTRICT

This takes in the coast-line from Marsland Mouth to Trevose Head. It includes that part of the county to the north of Launceston and the Bodmin Moors, and, in addition, the valleys of the Camel and Allen, with the estuary at Padstow. The former consists for the most part of a strip of high-lying, wind-swept land, of open tracts of undulating grass, trimmed short by the sea-breezes and tufted by sea-pinks and little mounds of wind-sculptured gorse, with here and there rough arable land, stony bits of common and stretches of heathery down, ending seaward in a great wall of seamed and fissured cliffs of slate, and broken abruptly by deep sheltering coombes. Down in the 'bottoms,' at the head of the coombes, wherever in fact there is shelter from the pitiless gales, the trees, and especially oaks, grow spontaneously and abundantly, but in the open the struggle is hopeless. Further back from the sea there is more arable land, and of better quality, but except in the valleys this makes little difference to the bird-life, for the inhospitable winds destroy all trees. The most important break in the rock-girt coast from Hennacliff to Tintagel is formed by the shallow low-lying valley of Bude. The gardens and orchards of Boscastle and the lovely sheltered wooden glen of Minster form another delightful oasis for bird life, and several woodland birds show a special affection for the charming Kneighton's Kieve, with its long strip of wood and abundant undergrowth.

Though the high cliff-land is more or less persistent all the way round to Trevose Head, the western portion of the district contains a good deal of

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fairly-sheltered land by the middle and lower reaches of the Camel, in the fertile valley of the lower Allen, and the long low-lying stretch of land between Pentire Point and St. Tudy. The estuary and tidal river have naturally a considerable influence on the bird-life, while the low-lying land from Wadebridge southwards facilitates the passage of birds into the district from the southern half of the county.

The wild coast-land to the east is the home of the chough and the buzzard. Probably nowhere in the British Isles is the latter so common as between Hennacliff and Boscastle. To see half a dozen at a time is a common occurrence, and this year five nests were found along half a mile of cliff face. The chough is unfortunately scarce, but has lately been increasing. The raven is also unusually common in the east of the district, especially about Kilkhampton. The white-tailed eagle appears to be an occasional visitor to the cliffs between Hennacliff and Bude, and peregrines still breed sparingly on the coast. The sheldrake nests regularly and in increasing numbers at the mouth of the Camel, its only breeding station in the county. The stock-dove breeds among dead gorse on the cliff face, and on the undercliff at Dizzard Head and elsewhere, while the rock-dove has recently established itself at several centres along the coast. The rock-pipit is locally plentiful. The shag is common, but the cormorant somewhat scarce. The oyster-catcher now breeds as far east as Bude, and the razorbill and guillemot at intervals up to the Gull Rock, near Marsland Mouth. The puffin nests in considerable numbers at Tintagel, and there is a colony every year at Trevalga. The herring-gull is locally common, but the lesser black-backed gull relatively scarce. Two or three pairs of the greater black-backed gull breed every year. The kittiwake is often much in evidence, but does not appear to nest. In spite of the increasing number of jackdaws, bird-life, however, except about Gull rocks and other favoured spots, is not by any means abundant on the coast.

Of small land birds the most interesting is the lesser white-throat, which occurs as a fairly regular autumn casual between Launceston and Bude, but has not been observed anywhere else in the county, except once at Scilly and once at Bodmin.

The absence of suitable cover on the long stretches of exposed land naturally results in a scarcity of warblers, wagtails, goldcrests, and many other small birds, and a greatly interrupted distribution of the starling, the jay, the rook, and the hooded-crow. While the dipper, willow-warbler, great, blue and long-tailed tits, wren, grey wagtail, meadow-pipit, chaffinch, greenfinch, linnet, corn and yellow buntings, swallow, martin, magpie, nightjar, green woodpecker, and cuckoo are widely distributed, the whitethroat, blackcap, spotted flycatcher, nuthatch, sand-martin, pied wagtail, gold-crest, coal-tit and marsh-tit, though all breeding in the low-lying portion of the western area, are practically limited in the eastern half to the valley of Bude, where most of them are autumn migrants. There is, however, a large colony of sand-martins at Widemouth every year. The goldfinch is fairly common about Boscastle, and, like the bullfinch, occurs in several of the coombes. The long-eared owl appears to be unknown, except by the Camel to the south of Egloshayle. The white owl still lingers in the St. Minver district and about Poundstock.

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3. ST. COLUMB-CAMBORNE DISTRICT

This district includes the coast line from Trevoze Head to Gwithian. In its northern division lies the beautiful vale of Lanherne, and to the east the picturesque Luxulian valley, with its surroundings of rough, dry heath-land. The middle division includes the Cornish china clay district, which with the Tregoss and other moors practically fills up the triangle between the Par to Newquay railway and the main line; while the western portion coincides with the most important mining area in the county. The coast-line consists for the most part of bold precipitous cliffs, with a long stretch of sand dune to the north of Perran Porth, and another at Gwithian. As in the Bude and Camel district the coast-land is pitilessly wind-swept, and therefore destitute of trees and in many places of cover of any kind. From an ornithological point of view the most important openings on the coast are Mawgan Porth, where a low-level marshy tract leads inward to the sequestered well-wooded brook-gladdened vale of Mawgan, the sheltered valley of the Gannel with its tree-brakes and abundant cover, and the flat inlet of Perran Porth at the south end of Perran Bay.

The ornithology possesses few features of special interest. The chough still nests between Trevoze Head and Mawgan Porth but the buzzard is only a casual visitor. The snow-bunting appears almost every winter on the dunes between Perran and Newquay, and the curlew probably breeds near the mouth of the Gannel, the only locality where it has been seen in North Cornwall. The whinchat is occasionally found about Newquay and the grasshopper warbler apparently nests there quite regularly. In the vale of Lanherne and the valley of the Gannel warblers and small birds generally are better represented than anywhere else in the northern districts. The lesser woodpecker breeds every year near St. Columb, and the reed-bunting near Luxulian. In 1901 a pair of hoopoes nested near Carworgie. The quail is by no means an unusual summer visitor, and occasionally breeds. One morning in early autumn some years ago fourteen were killed between Carworgie near St. Columb Road station and St. Dennis. In 1888 several Pallas's sand-grouse were shot on the Goss Moors and several on the moors near St. Austell. On the Goss Moors and elsewhere in the china-clay district the breeding birds include the lapwing, the curlew, snipe, mallard, teal, coot, moorhen, and common sandpiper, and occasionally at least the dunlin. In 1904 a pair of redshanks nested near Roche. The spotted crane is not uncommon, and the great solitary snipe has been observed several times.

The ordinary sea-birds are commoner than in the Bude and Camel district, with the exception of the puffin. There is a small summer colony of the Manx shearwater near Newquay—the only breeding station on the Cornish mainland. A few kittiwakes nested on one of the cliffs down till 1904, but none of them appeared last year. The spoonbill occasionally appears at Newquay in winter, and as many as nineteen have been observed in a flock.

4. TAMAR-FOWEY DISTRICT

This district extends from Werrington above Launceston southward between the Bodmin Moors and the Tamar to the sea, and westward between

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the Moors and the sea to the eastern boundary of the St. Columb-Camborne district. Many factors combine to make this the head quarters of the passerine birds of the county. The abundance of streams and deep wooded valleys, the quick alternation of sylvan and moorland, farmland and waste, and the reaches of sheltered fertile land, make it specially attractive to warblers, tits, wagtails, and finches; while its hills and exposed uplands, culminating in the Hingston Downs, the transition, sometimes gradual, sometimes abrupt, from the bleak borders of the moors through grazing and arable land to the richly-wooded Tamar on the east, and the warm inviting coast on the south, with its sheltered estuaries and tidal rivers, its broken and precipitous coast and its seductive valleys running up from the sea, attract birds of many different types. The deep valley of the Tamar and the lateral tributary valleys from the Bodmin Moors on the one side and Dartmoor on the other, and the easy passage of birds from north and south Devon, favour migration in the eastern part of the district; while the valley of the Fowey and its affluents and the valley of the Looe materially influence the movements and distribution of birds in the south.

In the eastern half of the district the redstart, wood-warbler, tree-pipit, and garden-warbler breed every year, nesting as far west as Trebartha. The grey wagtail, the dipper, and the spotted flycatcher, though breeding in suitable localities throughout the county, have their head quarters in this district. So also have the blackcap and the nuthatch, which breed but sparingly further west, and the greater and the lesser spotted woodpeckers, which till recently had not ventured outside the area between Trebartha and the Tamar. The ciril-bunting nests regularly, and the yellow wagtail occasionally in the south-east of the district. The willow-warbler, the sedge-warbler, and the coal-tit are locally abundant, and the whinchat and grasshopper warbler breed in the eastern half and at least occasionally between Looe and Liskeard, while the reed-warbler occurs every summer in the Looe valley. The marsh-tit is common, and about Trebartha is more abundant than anywhere else in the county. The corn-bunting is somewhat scarce, but the reed-bunting is represented by several widely separated colonies. The woodlark nests sparingly over the whole district from the Tamar to Restormel valley. The kingfisher is specially plentiful on some parts of the Fowey. The buzzard breeds at Boconnoc, and both the kestrel and the sparrow-hawk are much commoner than in the northern districts. The peregrine nests at Pelyn near Lostwithiel. Several pairs of ravens breed in the district. The heron is much in evidence, there being two heronries on the Fowey near Lostwithiel, one at Trenant near Looe which formerly contained about thirty nests but has now dwindled to two or three, and one in Sheviock Wood near St. Germans. There is also one at Warleigh on the Devonshire side of the Tamar. The stock-dove and the rock-dove are locally common both inland and on the coast. The wood-pigeon has become plentiful of late years in consequence of the increase of fir plantations. The sea-cliffs are in many places thickly populated with martins, jackdaws, swifts, shags and herring-gulls, with a few cormorants, lesser black-backed gulls, guillemots and razor-bills. The kittiwake still breeds in at least one locality. Oyster-catchers and ringed-plovers nest on the beaches at Looe and elsewhere. The lesser grebe is not uncommon on the estuaries and tidal rivers during the breeding season, and the great crested and occasionally the

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Slavonian grebe in winter. The red-necked grebe is an irregular visitor, in most winters scarce, but sometimes abundant—as in January, 1895, December and January, 1901–2, and March, 1905. The eared-grebe is occasionally seen during the winter months about Looe and the mouth of the Fowey. The great northern and the red-throated divers are regular winter visitors, though their numbers fluctuate greatly from year to year. The black-throated diver is an irregular winter casual. These divers are nearly always in immature plumage. Among the regular inland autumn and winter visitors are the black redstart, the brambling, the siskin, and the hawfinch. The lesser redpoll appears most winters in the neighbourhood of Lostwithiel.

5. TRURO-FALMOUTH DISTRICT

On the north this district extends from Par to Gwinear Road station along the southern boundary of the St. Columb-Camborne district. It includes the coast-line from Par to Nare Point below the mouth of the Helford river. The central topographical features of the district are Falmouth Bay and the estuaries of the Fal and Helford rivers, with their many tidal creeks and tributary streams. At low water the greater portion of most of the creeks consists of extensive reaches of mud divided by the shifting bed of the stream. In many cases the creek banks are richly wooded as at King Harry's reach, on the Ruan river, along the left bank of Tresillian river, and on the Helford river. At Plum Garden creek near Truro the fruit-trees overhang the water.

The district as a whole is hilly and mixed in character, woods and downs, magnificent furze-brakes, moorland and bog, being plentifully scattered among cultivated land of varied quality. The fine private grounds at Tregothnan, Carclew, Heligan, Penrice, Killiow, Enys, Clowance, Pendarvis, and elsewhere are naturally important centres of bird life, and the reed-beds at Swanpool and Pencalenick are more than usually attractive.

The coast too is very varied, sea-cliff alternating with covered slope and low-lying land. The long stretches of warm sand and boulder-strewn beach are broken by bold headlands, and the sea-line is cut by many wind-sheltered coves and bays. The cliffs in many parts are bold and rugged, draped here and there with ivy and patched with gorse. Some of the warm sheltered slopes like those round by Pendennis Castle have abundant cover and offer ready and congenial shelter to the adventurous forerunners of spring migration.

The landlocked sea running far into the hills, the diversity in the physical aspect and covering of the land, and the remarkably mild and equable climate of the sheltered area, make this in many respects the most favoured bird district in the county. Every bird mentioned above as breeding in the Tamar-Fowey district has nested at least occasionally here, with the solitary exception of the tree-pipit. Even the redstart, the woodwarbler and the yellow wagtail have nested in the district. The nuthatch may breed regularly about Penryn; the greater and lesser spotted woodpeckers have lately become residents in several of the private grounds. The red-backed shrike, the blackcap, the grasshopper warbler, the reed-warbler, the whinchat and the curl-bunting appear to breed every year; the sedge-warbler, white-throat and willow-warbler are locally abundant. The garden-warbler and

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the marsh-tit are fairly common about Falmouth. The corn-bunting is plentiful and the bullfinch locally common, but the goldfinch is gradually disappearing. The wood-lark appears to be confined to the east of the district. The kingfisher is seen at times on most of the streams in winter, but is becoming scarce in summer. The wheatear breeds on the downs; the grey wagtail on one, or perhaps two, of the moorland streams. The dipper and the goat-sucker are by no means rare and are generally distributed. Lately the corncrake and the water-rail have been noticeably scarce. The quail breeds not infrequently about Falmouth. The stock-dove nests as far west as the Helford river, and the rock-dove is now a well-established colonist at intervals along the coast. Perhaps the most conspicuous bird of the district is the heron, which has populous head quarters about Tregothnan and at Bosahan. No less than thirty-five were counted one afternoon along the sides of the main creek during a canoe journey between St. Just-in-Roseland and Truro. The little grebe, or 'dipchick,' the moorhen, the mallard, and the coot breed in suitable localities throughout the district, but the last two are much commoner in winter than in summer. The other grebes and the divers are on the whole commoner than in the Tamar-Fowey district. The regular winter visitors include the merlin, the black redstart, the brambling, the spotted crake and the redshank, the latter occasionally venturing as far up the estuary as the quay at Truro. The snow-bunting and the fire-crest are of frequent occurrence. In severe weather the bean-geese, brent-geese, and bernacle-geese are frequent visitors, the two former often occurring in large flocks. The white-fronted goose is only occasionally seen.

The mallard is the only duck that breeds regularly in the district, though young teal are not infrequently reported in the summer months. In the winter, however, not only are those two species abundant, especially in severe weather, but shovelers, pintail, and widgeon often appear in considerable numbers, and the pochard, golden eye, and of late years the scaup, are regular visitors. The tufted duck is erratic, but by no means rare, and the garganey is a not uncommon spring casual. The sheldrake is frequently seen in autumn and winter.

Falmouth Bay is naturally the centre of extensive migratory movements both in autumn and spring, and consequently many vagrants have been recorded from the two estuaries and from Swanpool, a small bird-frequented ley on the intervening coast, which forms the annual gathering-ground for many migratory species in the autumn. The vagrants include such rare birds as the red-breasted flycatcher, mealy redpoll, red-footed falcon, American red-winged starling, ruddy sheldrake, red-crested pochard, ferruginous duck, surf-scooter, avocet, black-winged stilt, pectoral sandpiper, little stint, Bonaparte's gull, ivory gull, black guillemot and Brünnich's guillemot.

6. LIZARD—LAND'S END DISTRICT

The island-promontory of the Lizard is one of the wildest and most solitary districts in Cornwall. It consists for the most part of an extensive plateau two or three hundred feet high, the central portion of which is formed by the Goonhilly Downs, while to the south lies the rough heathland that covers the outcrop of serpentine. The undulations on this great stretch

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of exposed upland are insignificant. The scarcity of trees, save towards the north-west, the absence of valleys, and the general monotony of the featureless surface make the number of resident species of land birds in the island promontory relatively small. The coast-line is one of great magnificence and beauty, with many inaccessible cliffs, numerous sea caves, and strips of narrow beach of sand, shingle and pebble. There is an entire absence of estuaries and creeks, as the Helford river, which forms one of the geographical boundaries of the peninsula, is for ornithological purposes more appropriately included in the Truro-Falmouth district. In the north-west, however, is the Loe Pool, a narrow winding stretch of fresh water, a mile and a half long, and separated from the sea by a bar of pebbles. Here the oak coppice that creeps down to the water's edge, the sloping tangled banks, the park of Penrose, the shelving meadows at the top of the lake, and the pretty wooded valley of the Cober, attract a bird population in many respects similar to that around the Fal. Several sheltered dells and charmingly-wooded grounds occur, too, on the north-western slopes of Goonhilly Downs. The most southerly strongholds of woodland birds in England are at Bochym and Bonython, half way between Helston and Lizard Point. Mount's Bay, from its geographical position, its remarkable climate, its splendid marshes, its orchards, groves, and the timber brakes that are scattered over the southern slopes for about two miles inland, is one of the most remarkable ornithological centres in England; while to the north St. Ives Bay, with its circling towans and great expanse of sandy beaches, presents unusual attractions to all kinds of wading birds.

The Land's End peninsula consists of granite and slate, the former predominating. Outside the zone just indicated, there are practically no trees, but for the most part a rough ragged country, with no taller cover than gorse. The interior consists, for the most part, of chains of granite hills, wild crofts, and desolate moors. To the north the scenery is wild and harsh, and dotted with granite tors. The fresh-water pools and marshes in the west naturally attract a large number of surface-feeding ducks during the winter. The coast presents a magnificent series of headlands and cliffs, chiefly of granite, jointed and weathered into enormous slabs of titanic masonry. On the south the granite barrier is broken at intervals by sheltered porths and coves terminating seawards in a patch of sandy beach. Such of the cliff-land along the south as is well sheltered from prevailing winds is, where practicable, devoted to the cultivation of broccoli, early potatoes, and narcissi.

With the exception of Montagu's harrier, which still breeds on Goonhilly Downs, there is no nesting bird peculiar to the district. The extreme westerly position and the exposed character of much of the surface result in a thinning-out of land species that, during the breeding season, are well represented in the Truro-Falmouth district, and a very local distribution of birds that elsewhere are fairly common throughout the southern half of the county. The nuthatch, lesser spotted woodpecker, garden-warbler, grasshopper-warbler, grey wagtail, marsh-tit, coal-tit, and wood-lark have not been recorded as breeding in this district, though they all do so in the neighbourhood of the Fal. The magpie is abundant, but it is doubtful if the jay has nested anywhere except in the neighbourhood of Meneage. The latter bird has been seldom seen at any time of the year either about

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Penzance or the Lizard. After the lapse of twenty-five years the Dartford warbler has again appeared among the gorse brakes round St. Burian. The blackcap, long-tailed tit, and lately the greater spotted woodpecker breed in the vicinity of Penzance, and the great tit is in evidence there the whole year round, though no nests have been found in that neighbourhood for several years. The whinchat and the goat-sucker nest sparingly, and the red-backed shrike has bred at least twice during the last six years near Marazion. With the exception of the chaffinch the finches seem to be on the decrease. The bullfinch has been well-nigh exterminated around the market-garden area; the goldfinch is now very scarce about Penzance, though not uncommon at one or two places in the Lizard peninsula, and even the greenfinch and linnet have greatly diminished in numbers round Helston. The corn-bunting is abundant; the reed-bunting nests in Marazion Marsh, and the curlew-bunting is still a summer migrant on the south of the Lizard. The sand martin no longer breeds about Penzance, and the swallow and martin are not so common as ten years ago. The swift, on the other hand, is much more numerous. The green woodpecker is now ubiquitous, and appears to be still increasing. The starling, too, now breeds as far south as the Lizard and as far west as Sennen. The wheatear, the lapwing, and the curlew breed on Lady Downs, near Penzance, and on Goonhilly. The ring-ouzel nests at least occasionally on the latter. The dipper breeds in the Cober valley, and the snipe near the Loe Pool, in the marsh at Penzance and in the parish of Crowan. Corncrakes are, as a rule, well represented in the Lizard, and cuckoos are usually commoner there than anywhere else in the county. The common sandpiper nests near Zennor and in the marsh at Penzance. Early last century the kite bred both in the Lizard and the Land's End district, and the hen harrier has been known to nest on Goonhilly Downs. The chough nested near Kynance and at Mullion as late as 1832, at Tol-pedn-penwith, near the Land's End till 1849 at least, and on the cliffs at Zennor till about 1870. The buzzard used to breed in the Land's End district, and in the late seventies a solitary pair were nesting near Zennor. The peregrine and the raven both breed at intervals round the coast. The tawny owl has a somewhat limited distribution, but big flights in winter are not uncommon. The barn owl is now very scarce. During winter the short-eared owl is plentiful, but the long-eared owl is only occasionally seen. Sea birds in places breed abundantly. Oyster-catchers and ring-plovers nest here and there, from Prussia Cove to Newlyn, and less commonly further west. The herring gull is abundant, the lesser black-backed gull nests at Kynance, Mullion, Gurnard's Head, and elsewhere. The kittiwake breeds on Mullion Island, and the greater black-backed gull at the Lizard and near Gurnard's Head. Shags and cormorants nest in considerable numbers all round the coast, and though the latter are in the minority they are much commoner as a breeding species in this district than anywhere else round the mainland. A few guillemots breed west of Kynance, and there is a small colony at Tol-pedn-penwith and probably also at Bosiggran Castle. Large numbers of razor-bills breed from Kynance westwards. Of the non-breeding birds of the district the most remarkable are the golden oriole and the fire-crest. The former is a regular spring visitor to the sheltered parts of the Land's End peninsula from Marazion westwards. One of their favourite haunts is Trevethoe, near

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Lelant, where they appear almost every year, and occasionally linger till the beginning of June, and give rise to the vain hope that they may be breeding. In April, 1870, several flocks of from eight to twenty birds frequented the grounds of Trevethoe for several weeks. Treviden, near St. Burian, and the warm fairly-timbered slopes around Mount's Bay have also great attractions for this beautiful bird of passage. The fire-crest is now an erratic but constant winter visitor to the Lizard and the Penzance district. Though generally occurring in twos and threes, companies of a dozen to twenty have been occasionally seen, and in the winter of 1880-1 and in November, 1905, there must have been many hundreds scattered over the district. The hoopoe is a frequent visitor in the spring, but does not appear to linger.

In addition to green and golden plover, snipe and woodcock, the winter visitors naturally include a large number of ducks. Mallard breed in the district and are always fairly common on the Loe Pool and on the fresh-water ponds and marshes of the Land's End during winter. So, too, are teal, wigeon, and shoveler, the last-named being at times the most abundant duck in the Land's End district. Pintail, pochard, and sheldrake are by no means scarce, and the other surface-feeding ducks occur irregularly. Coots are often plentiful, many hundreds appearing at a time on the Loe Pool. The red-breasted merganser is a winter visitor of regular occurrence in immature plumage, and in some years is very common. The grey-lag goose has been obtained several times. Brent and bean geese may appear in large flocks, the bernacle goose in little parties, and the white-fronted goose irregularly but not uncommonly, sometimes singly, sometimes in small gaggles, sometimes in considerable flocks. The whooper and Bewick's swans frequented Mount's Bay in some numbers during the severe winter of 1890-1. During the winter the black-headed gull often occurs in considerable numbers, particularly at Hayle. The purple sandpiper, too, is often in evidence both in Hayle estuary and Mount's Bay. The bittern is an irregular visitor to the district, but in the winters of 1880-1, 1890-1 was fairly common.

The marsh pools of the Land's End are visited every winter by a variable number of great crested, red-necked, Slavonian, and eared grebes, for the most part in immature plumage, as well as by little grebes which breed both there and by the Loe Pool. The great northern and red-throated divers occur every year off the Lizard, at Mount's Bay, and occasionally at Hayle. The black-throated diver puts in an occasional appearance, and during the last few years has occurred several times between St. Ives and Godrevy.

The remarkable ornithological character of the district lies not so much in its residents and regular visitors as in the number, variety and nature of its casuals and vagrants. As the most westerly land in England, this district is naturally the seat of extensive migratory movements, and in addition offers the most convenient refuge for continental autumn and winter migrants that, passing southwards along the coast-line of the European mainland, are driven back by contrary winds and storms from the south after passing beyond the mouth of the Channel. For storm-tossed birds from the south, Mount's Bay is not only an ideal haven of refuge, but from its position is the most likely landing-place in England for such as are driven northwards when weathering the western promontories of Brittany or in traversing the Bay of Biscay. In autumn and winter large flocks and detached parties of coasting birds of all kinds seek

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refuge here, and as elsewhere are often accompanied by stragglers that have become detached from their own kind on migration and lost their way. At times, too, solitary waifs and unattached parties that have wandered far from their regular flight-lines put in an appearance. Among the remarkable vagrants that have been obtained around this bay are three crested-larks, an ashy-headed wagtail, four Kentish plovers, two Baillon's crake, two American stints, a buff-breasted sandpiper, a solitary sandpiper, a yellow shank, a Bonaparte's gull, an ivory gull, and a sooty shearwater. The roseate tern formerly put in a casual appearance, but has not been recorded since 1842. Richard's pipit has occurred at least twice, and the wry-neck, the little stint, Temminck's stint, and the spoonbill are occasional but very irregular visitors. In the Land's End district the stragglers include the roller, the bee-eater, the white stork, the avocet, the Scandinavian water pipit, the velvet scoter, Baillon's crake (at Zennor), the buff-breasted sandpiper, the white-winged black tern, the gull-billed tern, and Pallas's sand-grouse, which appeared both in 1863 and in 1888. The rose-coloured pastor is by no means an infrequent visitor to the district from Marazion and Gwithian westwards to Land's End. The rare visitors to the Hayle estuary include two Bonaparte's sandpipers, several glossy ibis, and a number of little stints. Sabine's gull has visited the estuary several times, and in the autumn curlews and sandpipers are occasionally abundant. The spoonbill is more frequent in its visits here than at Mount's Bay, and parties of five to eleven have been recorded.

During the autumn months there is a strong migratory stream towards the west past the Lizard lighthouse, and this may be responsible for the appearance of such casuals as the dotterel, red-start, tree creeper, garden warbler and tree-pipit on the southern portion of the peninsula. Among the genuine waifs and strays to the Lizard district are an alpine swift, a yellow-billed cuckoo, a little owl, two Greenland falcons, a purple heron, a collared pratincole, three Bartram's sandpipers, and a flock of twelve bee-eaters. The late Mr. F. V. Hill of Helston mentions that a golden eagle frequented the woods at Trelowarren in January and February, 1859, and that though fired at several times escaped without injury.

7. THE ISLES OF SCILLY

The islands of Scilly form an archipelago 10 miles in length from NE. to SW., with a maximum breadth of 5 miles, and lie about 25 miles west of Land's End. By far the greater number are rocky islets, and of the five inhabited islands only Tresco, by virtue of the Abbey gardens and adjoining woods, can offer adequate shelter for the majority of visiting woodland birds. Except in the sheltered dip of Holy Vale trees are practically absent on St. Mary's; and St. Martin's, St. Agnes, and Bryher have no tall cover to offer except the hedges of veronica and escallonia that in all the cultivated islands protect the bulb beds from the wind. The rock throughout is granite, and though the highest point in the archipelago is only 170 feet above sea level, several of the cliffs are imposing and practically inaccessible. The fresh-water pools at Tresco are naturally much frequented by aquatic birds of passage and winter visitors, and the moors of St. Mary's and elsewhere at times attract a considerable population. During the breeding season such rocky islets as are not exposed to the occasional wash of an Atlantic breaker are thickly populated by the sea birds—gulls, razor-bills, puffins, shags, cormorants,

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and a few guillemots all noisily living in company. Terns, as a rule, form separate colonies on the smaller inner rocks. The greater part of the flat turf-covered island of Annett is literally riddled with the burrows of puffins and Manx shearwaters that nest here in thousands. Ringed plovers, oyster-catchers, and rock-pipits breed in great numbers all round the inhabited and on several of the uninhabited islands including Annett, Samson, St. Helens and Great Ganilly.

The conditions of bird life in Scilly differ greatly from those on the mainland. From the point of view of migration these islands are second in importance only to Heligoland, but the subject is too complex to treat in limited space. The extent to which the migratory movements over the archipelago differ from those that affect the bird population of the mainland is to some degree indicated by the fact that no fewer than fourteen species have occurred as accidental visitors at Scilly that have not been recorded for the rest of the county at all. These fourteen species are :

| | |
|-----------------------|----------------------|
| Yellow-browed warbler | Lesser kestrel |
| Water pipit | American bittern |
| Lesser grey shrike | Little ringed plover |
| Woodchat | Killdeer plover |
| Ortolan bunting | Red-breasted snipe |
| Short-toed lark | Esquimaux curlew |
| Iceland falcon | Whiskered tern |

Nearly all these waifs and strays have occurred in autumn, and indeed most of the rarities at Scilly occur at that season, so that the autumn migratory movements are presumably much more complex than those of the spring.

The total number of species in the county ornith is 303, exclusive of sundry introductions and escapes from captivity. The number for Devonshire as indicated in D'Urban and Mathew's *Birds of Devon* (ed. 2) is 290, and the inclusion of the melodious warbler and Continental Coal Pit brings the total up to 292. The following table shows the status of the birds in the two counties :—

| | Cornwall | Devon |
|-------------------------------|-----------|-----------|
| Residents | 83 | 85 |
| Summer migrants | 27 | 31 |
| Winter visitors | 38 | 38 |
| Birds of passage | 15 | 17 |
| Casual visitors | 70 | 66 |
| Accidental visitors | 65 | 54 |
| Miscellaneous | 5 | 1 |
| | <hr/> 303 | <hr/> 292 |

The miscellaneous birds include in each county the pheasant, an introduced resident; and for Cornwall the turnstone, which occurs in the county all the year round and may have bred at Scilly; the gannet, which is certainly resident but does not appear to have ever bred in the county; the turtle-dove, a regular summer visitor for which only one single nest has been recorded, and the roseate tern, which formerly bred at Scilly, but has been extinct in the county for more than thirty years.

Apart from the pheasant the introduced and semi-naturalized birds that have been shot in the county include :—

| | |
|-----------------------|--------------------------|
| Canadian goose (3) | American summer duck (1) |
| Egyptian goose (2) | Red-legged partridge (1) |
| Spur-winged goose (1) | Barbary partridge (2) |

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In addition to the 110 residents and summer migrants that breed in the county, the following birds formerly nested regularly, but have ceased to do so subsequently to 1840. The date after the name is that of the last authenticated nest :—

Marsh harrier (1855)
 Hen harrier (1841? 1903-5)
 Rough-legged buzzard (about 1859)
 Kite (1842)

Hobby (1862)
 Roseate tern (after 1854)
 Black-headed gull (about 1845)

The following species have nested at least once in the county since the middle of the century :—

Yellow wagtail (frequently)
 Hawfinch (once)
 Hoopoe (once)
 Turtle-dove (once, Scilly)
 Quail (often)

Spotted crane (often)
 Turnstone (more than once, Scilly)?
 Redshank (once)
 Woodcock (once)

Among the accidental visitors to the county there are, as previously mentioned, no less than eighteen American species, namely :—

Red-winged starling
 Yellow-billed cuckoo
 Hawk owl
 Little green heron
 American bittern
 Surf scoter
 Killdeer plover
 Pectoral sandpiper
 Bonaparte's sandpiper

American stint
 Buff-breasted sandpiper
 Bartram's sandpiper
 Solitary sandpiper
 Yellow shank
 Red-breasted snipe
 Esquimaux curlew
 Bonaparte's gull
 Ivory gull

Apart from introduced species there are thirteen birds that have occurred in Devonshire and not in Cornwall:—

Nightingale
 Red spotted bluethroat
 Black-headed warbler
 Rufous warbler
 Alpine accentor
 Crested-tit?
 Serin

Nutcracker
 Buff-backed heron
 Red-breasted goose
 American green-winged teal
 Caspian tern
 Great black-headed gull

Of these the nightingale is a summer migrant, the crested-tit a casual and all the others accidental visitors. The little egret has occurred in Devonshire, and may have to be added to the above list, as there is some doubt about its appearance in Cornwall.

Twenty-four species have occurred in Cornwall that have not yet been found in Devonshire :—

Yellow-browed warbler
 Tawny pipit
 Scandinavian rock pipit
 Red-breasted flycatcher
 Ortolan bunting
 Red-winged starling
 Short-toed lark
 Scop's owl
 Spotted eagle
 Iceland falcon
 Lesser kestrel
 Little green heron

Collared pratincole
 Red grouse
 Baillon's crane
 Little ringed plover
 Killdeer plover
 Bartram's sandpiper
 Solitary sandpiper
 Yellow shank
 Esquimaux curlew
 Roseate tern
 Bonaparte's gull
 Brännich's guillemot

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Of these the roseate tern formerly bred in Cornwall, Baillon's crake is a casual, and the red grouse may have been introduced. The others are accidental visitors.

Among the accidental visitors to the county five have been included in the accompanying annotated list of Cornish birds, the evidence for the occurrence of which is not sufficiently conclusive, namely, the great reed warbler, the pine grosbeak, the crested-tit, the little egret, and the sooty tern. These are enclosed in square brackets in the list and are not included in any of the totals or numerical references.

1. Mistle Thrush. *Turdus viscivorus*, Linn.
Locally, Holmscreetch.

A fairly common resident throughout the county. From July to October large flocks of young birds are frequent in the east and occasional in the middle and west, lingering in favoured localities for days and sometimes for weeks. A fairly regular winter visitor to Scilly, usually in small numbers.

2. Song Thrush. *Turdus musicus*, Linn.
Locally, Graybird.

A very common resident, and breeding on all the inhabited islands at Scilly. From September to November in W. Cornwall the migratory birds greatly outnumber the natives. The winter movements are complex, and at times very few birds seem to be left in the county.

3. Redwing. *Turdus iliacus*, Linn.
Locally, Winnard.

A winter visitor, usually common and generally distributed on higher ground throughout the county, but numbers and distribution vary considerably. Though it does not leave a locality so promptly as the fieldfare on the approach of severe weather, during hard frosts it is usually very abundant in the Lizard and Land's End district. Plentiful at Scilly.

4. Fieldfare. *Turdus pilaris*, Linn.
Locally, Blue Bird.

A winter visitor, usually common, but in some years, as in 1859-63, 1892, and 1899, remarkably scarce; usually abundant in the Lizard and Land's End district in severe weather. Common at Scilly.

5. White's Thrush. *Turdus varius*, Pallas.

An accidental visitor; one killed near Probus in January, 1874, one in Tresco Abbey gardens, 2 December, 1886, one at Looe in the winter of 1898-9, and one seen repeatedly near Devoran in March, 1903, by several observers.

6. Blackbird. *Turdus merula*, Linn.

An abundant resident, evidently increasing. Commoner at Scilly than on the mainland.

7. Ring Ouzel. *Turdus torquatus*, Linn.

A summer migrant breeding in small scattered colonies on the Bodmin moors in the neighbourhood of Rough Tor, Brown Willy, Kilmaur, Hawk's Tor, and the Cheesewring, sparingly on the Kilhampton moors, and at long intervals on Goonhilly Downs. Numerous passing migrants, occasionally in flocks of twenty or more, may be seen on the moors throughout the county as far west as Zennor in the spring and again from August to October. Occasionally one or two may be seen for several weeks at a time in the

east of the county during the winter months when the weather is not very severe. In the sixties it used to nest in considerable numbers, but of late years has been somewhat scarce at the breeding season. Frequently seen during September and October at Scilly. On 12 April, 1903, a flock of over 100 arrived with a south-easterly wind on the north side of Old Town Bay, St. Mary's.

8. Wheatear. *Saxicola oenanthe* (Linn.).¹

A summer migrant, commoner during the breeding season in the east than in the west of the county, but abundant in the Lizard and in some parts of the Penzance district. Large flocks arrive on the south coast every spring, most of which after resting for a few days resume their journey to the north. A considerable number, however, pass slowly along well-defined routes to the uplands of the county, where they breed, while a few pairs remain to nest by the sea. It appears in large numbers on the low-lying fallow-land from the end of August till the middle or end of October. It breeds rather sparingly in Scilly, but is abundant during spring and autumn migration.

9. Whinchat. *Pratincola rubetra* (Linn.).

A somewhat local summer migrant, occasionally seen in the east of the county during the winter; breeds sparingly as far west as Falmouth, and is fairly common about Poundstock; flocks occasionally seen about Mount's Bay in September, as in 1899 and 1904. Occurs at Scilly singly in autumn.

10. Stonechat. *Pratincola rubicola* (Linn.).
Locally, Furzechitter.

A common resident throughout the county; more abundant in summer than in winter. In the first week of May, 1903, there must have been about thirty pairs on St. Helen's, Scilly, all evidently breeding.

11. Redstart. *Ruticilla phoenicurus* (Linn.).

One of the scarcest of Cornish summer migrants; nests in the east of the county by the side of the Tamar and occasionally at least at Trebartha and about Liskeard. In the spring of 1904 two nests were found between Truro and Falmouth, the only known instances of its breeding in the west of the county. Occurs at Scilly every autumn both in pairs and in small flocks.

12. Black Redstart. *Ruticilla titys* (Scopoli).

A not uncommon winter visitor throughout the county except on the north coast; often occurs singly, and generally in immature plumage; a fairly frequent solitary migrant at Trebartha in the autumn. Visits

¹ Brackets placed round the name of the original describer of a species indicate that he did not employ the generic name which is now adopted.

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Scilly during autumn migration and irregularly throughout the winter.

13. Redbreast. *Erithacus rubecula* (Linn.).

Common and generally distributed throughout the county, including Scilly.

14. Whitethroat. *Sylvia cinerea* (Bechstein).

A summer migrant, but very unevenly distributed; common about Launceston, Liskeard, Bodmin, the Lizard and Penzance, but never seen about Camel-ford, rare at Trebartha, and though remarkably abundant about Truro in 1902, was not again recorded till 1905. An autumnal visitor at Scilly.

15. Lesser Whitethroat. *Sylvia curruca* (Linn.).

A casual autumn visitor to the Bude and Launceston district; obtained at Bodmin in September, 1904, and at Scilly in 1857.

16. Blackcap. *Sylvia atricapilla* (Linn.).

A summer migrant, not uncommon in the east of the county, but scarce elsewhere, though nesting as far west as Penzance. Has been seen at Scilly occasionally on autumn migration and twice in January.

17. Garden Warbler. *Sylvia hortensis* (Bechstein).

A summer migrant breeding regularly in the east, but except around Falmouth apparently rare in the rest of the county; on 27 September, 1900, a storm-tossed flock of fifteen appeared at Kenwyn, Truro, and rested there for two days, the only record of its occurrence in that district; recorded as an autumn migrant at the Lizard. Only reported three times from Scilly, viz., 1849, October, 1874, and 29 September, 1900.

18. Dartford Warbler. *Sylvia undata* (Boddaert).

Locally, Pink-eye.

This resident bird was in the late seventies fairly common in the Land's End district and bred in suitable localities throughout the county. The severe winters of 1880-1 and 1886-7 seem to have almost exterminated it in the south-western peninsula, and from 1885 there is no further Cornish record till May, 1899, when it was seen by Miss E. A. Reynolds at Hayle. In April, 1904, a nest with five eggs was found near Penryn, and in 1905 a nest with four young ones near Linkinhorne, and another with four eggs near St. Burian.

19. Gold-crest. *Regulus cristatus* (Koch).

Resident; fairly common and generally distributed in congenial localities, but not nearly so abundant as twenty years ago; in the autumn and winter frequently reinforced by immigrant flocks, which on several occasions during the past five years must have contained many thousands of birds. Does not breed at Scilly, but arrives in large flocks in autumn and winter.

20. Fire-crest. *Regulus ignicapillus* (Brehm.).

A regular visitor, usually in small numbers, in autumn and winter, to the south of the county from Looe to Scilly, but most frequent in the west. In October, 1900, several came in at the Lizard on an easterly wind with a large flock of chiffchaffs and several black redstarts, and two were seen at Tresco. In January, 1901, over a dozen frequented some fir trees near Tregothnan, with a number of gold-crests, for about a fortnight. In November, 1902, one was

shot near Truro; in November, 1903, there were several at Tresco, and in the first week of December, 1904, two were seen for several days near Gulval, and one was shot near Helston. At times common at Scilly.

21. Yellow-browed Warbler. *Phylloscopus superciliosus* (J. F. Gmelin).

Two shot on St. Martin's Common, Scilly, in October, 1867, by Pechell, were mistaken for fire-crests in immature plumage, and were not identified till 1890. On 1 October, 1905, David Smith killed another specimen with a stick on Tresco.

22. Chiffchaff. *Phylloscopus rufus* (Bechstein).

A fairly common summer migrant, not infrequently heard and seen during the winter months. Small flocks on migration are common in the autumn, especially with an easterly wind. Appears on Tresco and St. Mary's every autumn, and has been recorded so frequently during the winter that it is probable a few remain most years till the spring.

23. Willow Warbler. *Phylloscopus trochilus* (Linn.).

A summer migrant, common but local; fond of nesting near running water. In some years extraordinary numbers arrive on the south coast about the middle of April. So far only recorded for Scilly as an autumn bird of passage, but two were both seen and heard in Tresco Abbey gardens in April, 1904.

24. Wood Warbler. *Phylloscopus sibilatrix* (Bechstein).

A summer migrant locally common in the east of the county, but either very rare or overlooked in the middle and west and at Scilly. In 1904 it nested near Devoran, and in May, 1903, several specimens were seen and heard at Tresco; at least an occasional bird of passage in spring and autumn at Scilly.

25. Melodious Warbler. *Hypolais hypoglossa* (Vieillot).

An accidental visitor, represented by a solitary adult male shot at Sandplace, near Looe, 12 May, 1905.

26. Reed Warbler. *Acrocephalus streperus* (Vieillot).

A summer migrant, scarce and local, known only in the south of the county from Looe to Falmouth; has bred near Truro every year since 1899. In April, 1904, there were several in song by the side of the Long Pool, Tresco.

[Great Reed Warbler. *Acrocephalus turdoides* (Meyer).

About the end of September, 1884, David Smith shot a bird on the reeds at Long Pool, Tresco, which he identified as this species. He had it in his hand, and 'It spread out its tail like a fan; before he could kill it, it slipped from his hand and went away like a mouse.' (Note in the Abbey MS. Bird Record for the Isles of Scilly.)]

27. Sedge Warbler. *Acrocephalus phragmitis* (Bechstein).

A summer migrant locally distributed throughout the county, but commoner in the south and west than in the north. Breeds freely on Tresco.

28. Grasshopper Warbler. *Locustella naevia* (Boddaert).

A scarce summer migrant, somewhat commoner on autumn migration; nests have been found now and then from Trebartha to Falmouth and at Newquay. Recorded by the Rev. H. O. Astley, on Tresco, 12 May, 1901, and two were watched for over an hour on Samson, 13 April, 1903.

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29. Hedge Sparrow. *Accentor modularis* (Linn.).

Resident and abundant throughout the county, except on the Bodmin moors; large flocks occasionally seen at the Lizard in the autumn. A common resident at Scilly.

30. Dipper. *Cinclus aquaticus*, Bechstein.

A resident, fairly common on the upper portions of the Lynher, Inney, and Camel and on the Draynes river, Liskeard; nests regularly on several of the streams of the middle and west.

31. Bearded Tit. *Panurus biarmicus* (Linn.).

A rare accidental visitor, obtained thrice in the county; once near Helston, by Humphrey Grylls of Bosahan; once in January, 1846, in a sedgy bottom near St. Levan church; and once on the higher moors, St. Mary's, Scilly, in the fifties.

32. Long-tailed Tit. *Acredula caudata* (Linn.).

Locally, Bottle Tit.

Resident, fairly abundant, but local throughout the county; decidedly uncommon about Camelford, and since 1900 in the Truro district. Small flocks arrive on the south coast during the winter. Till lately the only record of this bird at Scilly was for October, 1876, when David Smith shot three out of a family of seven, but several birds were seen at Tresco in the autumn of 1903 and again in 1905.

33. Great Tit. *Parus major*, Linn.

A common resident and generally distributed; in some years specially abundant at the Lizard in the autumn; though common in the Penzance district, has not bred there lately; scarce about Launceston during the winter. Appears at Scilly in small numbers in autumn, and occasionally lingers for several weeks about Tresco.

34. Continental Coal-Tit. *Parus ater*, Linn.

Though the distinction between this species and the next is dubious, it is interesting to record a typical specimen shot 3 April, 1904, at Mount's Bay.

35. British Coal-Tit. *Parus britannicus*, Sharpe and Dresser.

A fairly common resident in fir and pine plantations, especially in the east of the county, but not so abundant as the great tit; nests as far west as Falmouth, but not in the Penzance district, and is rarely seen at the Lizard; scarce about Launceston in winter. Has occurred only once at Scilly, in October, 1851.

36. Marsh-Tit. *Parus palustris*, Linn.

Resident but local; breeding in the east of the county and freely in the west about Falmouth, but elsewhere a scarce bird at all times of the year; at Trebartha more plentiful than the coal-tit during the breeding season, abundant during the autumn, and in the winter season the commonest member of the family. Obtained at Scilly about the same time as the coal-tit mentioned above, and also seen twice by F. R. Rodd about 1863.

37. Blue-Tit. *Parus coeruleus*, Linn.

Locally, Hackeymall, Hickmall.

Resident, abundant and generally distributed. Occurs at Scilly occasionally singly or in pairs during the autumn and winter; probably blown off the mainland by storms.

[Crested-Tit. *Parus cristatus*, Linn.

John Harris of Liskeard saw two crested-tits in the autumn of 1899 at High Wood, Looe Mills. One was in some alders; the other in a little adjoining plantation.]

38. Nuthatch. *Sitta caesia*, Wolf.

Resident; a familiar bird in the eastern woodlands; breeds regularly as far west as Doublebois, in most years about Bodmin, and occasionally about Falmouth; has nested twice at Helston; common in the middle and west as a winter visitor.

39. Wren. *Troglodytes parvulus*, Koch.

Resident; common and generally distributed throughout the county and at Scilly; about Truro and Falmouth usually more abundant in winter than in summer.

40. Tree-Creeper. *Certhia familiaris*, Linn.

Resident; nesting and fairly common in most of the old woods throughout the county; not infrequently seen at the Lizard.

41. Pied Wagtail. *Motacilla lugubris*, Temminck.

Locally, Dishwasher, Tinner.

Resident; generally distributed except in the Camelford district and on the north coast from Pentire, Padstow to Dizzard Head, where wagtails are represented only by occasional casuals; in many districts extraordinarily abundant. Large migratory flocks chiefly of immature birds occur in the south and west of the county in September. From 6 to 9 September, 1904, a flock of two or three thousand lingered on passage in the neighbourhood of Bude. In the spring from the second week in March till the end of the second week in April numerous small flocks come in on the south coast, the first arrivals being exclusively adult males. Nests on all the larger islands at Scilly.

42. White Wagtail. *Motacilla alba*, Linn.

Evidently a regular spring and autumn bird of passage about St. Ives, Falmouth, and Penzance, and an occasional passing visitor elsewhere; almost always associated with migratory flocks of pied wagtails. On 29 May, 1904, an adult male was killed near Truro. Several were seen on St. Mary's early in October, 1903, in a large flock of pied wagtails.

43. Grey Wagtail. *Motacilla melanope*, Pallas.

Resident, but more abundant as a winter visitor; breeds in considerable numbers by the side of the streams in the east of the county, and occasionally as far west as Truro. At Scilly a regular autumn and winter migrant. In the spring of 1903 was common about High Town, St. Mary's, from 10 to 18 April.

44. Blue-headed Wagtail. *Motacilla flava*, Linn.

A casual spring and summer visitor to the west of the county. Two specimens were shot by Pechell at Scilly in September, 1871, but it has not been recorded there since.

[Ashy-headed Wagtail. *Motacilla cinereicapilla*, Savi.

Of this subspecies, one of the two recorded English specimens was killed at Penzance and was identified by Gould.]

45. Yellow Wagtail. *Motacilla raii* (Bonaparte).

A spring and autumn visitor in small numbers, lingering at times for several weeks on both journeys;

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in some years, e.g. 1901, 1902, and 1903, a few birds spend the winter about Truro and Falmouth; occasionally seen during the winter on Marazion Marsh flats; has nested several times in the east and middle of the county. Large numbers appear at the Lizard in the autumn. Fairly plentiful at Scilly in the autumn of some years, notably 1890 and 1903.

46. Tree Pipit. *Anthus trivialis* (Linn.).

A summer migrant abundant in the east of the county, occasionally seen in the middle and at long intervals on migration in the west. An occasional autumn and winter visitor to Scilly. An adult male was found dead on St. Agnes early in June, 1902.

47. Meadow Pipit. *Anthus pratensis* (Linn.).

Resident; abundant and generally distributed in all open situations throughout the county during the warmer months, but for the most part restricted to lower-lying ground in the winter; numbers increased by immigration during autumn and winter. A common resident at Scilly.

48. Tawny Pipit. *Anthus campestris* (Linn.).

An accidental visitor, represented by a single specimen shot by Pechell near Old Grimsby, Tresco, 19 September, 1868, and by one caught at Bodmin, 16 September, 1899.

49. Richard's Pipit. *Anthus richardi*, Vieillot.

A casual autumn and spring visitor to the west of the county and Scilly, obtained on at least eight different occasions and seen twice. On 16 May, 1903, a pair were watched for over an hour near Holy Vale, St. Mary's.

50. Water Pipit. *Anthus spiolella* (Linn.).

A rare casual, so far only once obtained in the county, namely by Clark at Scilly, 6 May, 1903.

51. Rock Pipit. *Anthus obscurus* (Latham).

Locally, Pinnick.

Resident; common in many localities around the coast; large flocks of passing birds come in from the south-east in the spring. Nests in considerable numbers on nearly all the islands at Scilly, including Guthers and Round Island.

52. Scandinavian Rock Pipit. *Anthus rupestris*, Nillson.

A rare casual; one specimen killed near Land's End by J. H. Gurney, and one at Scilly, 11 May, 1903, by J. G. Millais.

53. Golden Oriole. *Oriolus galbula*, Linn.

An annual passing visitor in spring to W. Cornwall and Scilly, appearing usually in April and remaining sometimes as late as the beginning of June. The groves of Trevethoe, near Lelant, are a favourite haunt of this bird, and in 1870, over forty occurred there during the course of the season. It frequently appears on the slopes round Mount's Bay and throughout the Land's End district. At Tresco it appears every spring in the Abbey gardens, where five have been heard singing at one time. It has been occasionally reported from the middle and twice from the east of the county.

54. Great Grey Shrike. *Lanius excubitor*, Linn.

A rare casual winter visitor, taken three times in the county, including once at Gweek about thirty

years ago, and once, an adult male, at Bodmin on 26 November, 1898.

55. Lesser Grey Shrike. *Lanius minor*, J. F. Gmelin.

A rare accidental straggler; a single specimen shot at Scilly by Pechell in November, 1851, but at first mistaken for the preceding species.

56. Red-backed Shrike or Butcher Bird. *Lanius collurio*, Linn.

A scarce summer migrant in the west and north of the county, less infrequent in the north-east; last recorded nests, Marazion, May, 1899, and Killiow, Truro, June, 1902. A rare autumnal visitor at Scilly.

57. Woodchat. *Lanius pomeranus*, Sparrman.

An accidental visitor to Scilly in 1840 and again in the autumn of 1849.

58. Waxwing. *Ampelis garrulus*, Linn.

A casual winter visitor; several specimens killed about the Lizard in 1828, one at Scilly in the early forties, and a number throughout the county in the winter of 1849-50, since which date there is no further record.

59. Pied Flycatcher. *Muscicapa atricapilla*, Linn.

A not infrequent autumn and spring visitor to Scilly, but on the mainland seldom seen; one taken at Penzance in autumn, 1849, two at Looe in 1878, one at Par in May, 1886, one near Wadebridge, 23 April, 1891, and one at Liskeard in September, 1900.

60. Spotted Flycatcher. *Muscicapa grisola*, Linn.

A summer migrant; very common in the east, but breeding in suitable localities throughout the county. Hitherto only recorded from Scilly as an autumn bird of passage in immature plumage; but on 7 July, 1903, a nest with young birds was found by Clark on the west side of Bryher.

61. Red-breasted Flycatcher. *Muscicapa parva*, Bechstein.

An accidental autumn and winter vagrant; first British specimen, a female, shot by Copeland near Constantine, Falmouth, in January, 1863; a second specimen shot at Scilly, October, 1863, and a third also at Scilly, 5 November, 1865.

62. Swallow. *Hirundo rustica*, Linn.

An abundant summer migrant, generally distributed; occasionally seen in November, sometimes seen in December and even in January.

63. House-Martin. *Chelidon urbica* (Linn.).

An abundant summer migrant and generally distributed, but does not breed so commonly in the west as formerly; has been occasionally recorded in November, December, and January. Does not breed at Scilly, but is by no means uncommon.

64. Sand-Martin. *Cotile riparia* (Linn.).

A summer migrant; usually found where suitable nesting sites are available; has not bred about Penzance for some years, though formerly common in that district; very local on the north coast. Only a casual visitor to Scilly in spring and autumn.

65. Greenfinch. *Ligurinus chloris* (Linn.).

Resident; common and generally distributed. Large flocks arrive in the autumn and depart in the early spring. In November, 1894, a flock of many thou-

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sands put in at Portscatho. A winter visitor at Scilly, occasionally, as in 1849, 1894, and 1904, in large flocks.

66. Hawfinch. *Coccothraustes vulgaris*, Pallas.

A scarce but regular winter visitor, evidently increasing in numbers in the middle of the county; was common at Boconnoc during the winter of 1901-2; has nested at least once, near Launceston. An occasional visitor at Tresco in spring and autumn, in immature plumage.

67. Goldfinch. *Carduelis elegans*, Stephens.

Resident; but nowhere common, and in some districts becoming very scarce. The numbers seem to be reinforced on thistle ground in the early autumn, and in March small flocks arrive on the south coast, and occasionally travel inland without dispersing. Towards the end of March, 1900, fifty birds, evidently all males, were seen at Tolcarne. Appears at Scilly in family parties in autumn and winter.

68. Siskin. *Carduelis spinus* (Linn.).

A regular winter visitor to the Lostwithiel district, sometimes in large numbers, arriving in October and staying till March, latest date the 25th of that month; a frequent winter casual in the rest of the county. Seen occasionally at Tresco during the autumn and winter. In January, 1904, five spent some days among the *Pinus lambertianus* on the Abbey drive.

69. House Sparrow. *Passer domesticus* (Linn.).

Resident; extremely abundant and generally distributed wherever human habitations are to be found, except in some of the valleys among the Bodmin moors, where it is decidedly scarce. In July, 1903, it was common on Samson.

70. Tree-Sparrow. *Passer montanus* (Linn.).

A casual winter visitor, rarely recorded but possibly overlooked. The last two birds shot in the county were, at Scorrier in the autumn of 1897, and near Pencalenick in November, 1904. In the list of Scilly birds at the end of Rodd's *Birds of Cornwall* this species is said to be occasionally met with, but no authentic specimen or definite record can be found.

71. Chaffinch. *Fringilla coelebs*, Linn.

Locally, Fink, Copperfink, White Finch (female).

Resident; very abundant and generally distributed except about Newquay, where it is not common. Large flocks occasionally seen in autumn, winter, and spring. Occasionally, as in March, 1904, large flocks, usually of females, visit Scilly.

72. Brambling. *Fringilla montifringilla*, Linn.

A winter visitor chiefly recorded from the southern half of the county, usually rare, but in some seasons remarkably abundant, as in March, 1858, the winters of 1859-60 and 1890-1, and in October, 1902.

73. Linnet. *Linota cannabina* (Linn.).

Resident; common and generally distributed; large flocks about Falmouth and the Lizard in autumn and winter. Occurs at Scilly in large flocks often mixed with chaffinches in autumn and spring, and irregularly during the winter. In 1903 nests were found on Garrison Hill, St. Mary's, and on St. Martin's.

74. Mealy Redpoll. *Linota linaria* (Linn.).

A casual visitor represented by an adult male shot many years ago at Carrythenick, and one in immature plumage near Feock on 19 December, 1903.

75. Lesser Redpoll. *Linota rubescens* (Vieillot).

A casual winter visitor from the north; often caught with siskins at Lostwithiel, with linnets at Penzance, and occasionally shot singly at Stratton and elsewhere.

76. Twite. *Linota flavirostris* (Linn.).

A rare casual winter visitor. One shot at Penzance over thirty years ago. After the cold stormy weather of March, 1901, seven birds were seen at Cardinham and two shot. One was killed at Lostwithiel towards the end of November, 1904.

77. Bullfinch. *Pyrrhula europaea*, Vieillot.

Locally, Hoop, Hope, Bud-picker.

Resident; locally distributed throughout the county, and in some places fairly numerous; formerly common in the Penzance district, but has been almost exterminated by the market-gardeners. It does not appear to have visited Scilly till the last few years. In the spring of 1903 it was plentiful on St. Mary's, Samson, and Bryher, and in April, 1904, a flock of about twenty spent several days in the churchyard at Old Town.

[Pine Grosbeak. *Pyrrhula enucleator* (Linn.).

In a letter to E. H. Rodd, dated 29 March, 1877, Alan Furneaux, of St. Germans, writes, 'I observed [on 8 November, 1868] a pair of strange finches feeding on the cones of an *arbor vitae* not five yards from a window in this house. I had time to view them with the aid of a binocular. The back of the male was bright crimson, and to the best of my recollection relieved with dusky spots. The mandibles were short and blunt, but to my view ended in a distinct point and did not cross. On comparing the bird with the plate [of the pine grosbeak] in Mr. Morris's work I felt no doubt.'¹]

78. Crossbill. *Loxia curvirostra*, Linn.

A fairly common casual visitor of irregular occurrence; on several occasions seen in flocks, those of August and September, 1898, being fairly well distributed throughout the county.

79. Two-barred Crossbill. *Loxia bifasciata* (Brehm).

A single specimen of this accidental straggler was shot at Lariggan a few years prior to 1843, when it was seen and identified by E. H. Rodd.

80. Corn-Bunting. *Emberiza miliaria*, Linn.

Locally, Horse lark, Bunting lark.

Resident; scarce in the east of the county, but common along the north coast and at the Lizard and in the Falmouth and Truro districts, where it has a strong partiality for telegraph wires. Also a resident at Scilly, but most abundant in flocks late in the autumn.

81. Yellow Hammer. *Emberiza citrinella*, Linn.

Locally, Gladdie.

Resident; a common hedgerow bird throughout the county. Very rare at Scilly; Pechell shot one in the autumn of 1849, and saw another some years later.

¹ See also J. H. Gurney in the *Zoologist* for 1877, p. 248.

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82. Cirl Bunting. *Emberiza cirlus*, Linn.

Resident but local; breeds south of Liskeard, in most years at the Lizard, and sparingly elsewhere on the south coast; has been seen on the Gannel near Newquay, and may have nested there. So far only two specimens recorded from Scilly, one obtained November, 1857, and one December, 1859.

83. Ortolan Bunting. *Emberiza hortulana*, Linn.

One example of this accidental visitor was shot by Pechell on a wall at Tresco Abbey, 7 October, 1851.

84. Reed Bunting. *Emberiza schoeniclus*, Linn.

Resident in small colonies throughout the county, on the moors at Trebartha, at St. Germans, at Gunwon, Luxulian, and at Marazion. An occasional autumn and winter visitor at Scilly, singly or in small parties.

85. Snow Bunting. *Plectrophenax nivalis* (Linn.).

A fairly constant but not very common winter visitor to the high lands near the coast, occasionally singly, but usually in pairs or in small parties; almost invariably in immature plumage. A regular early autumn visitor at Scilly, occasionally appearing during the winter and rarely in spring. All have been in autumn plumage except one splendid specimen in full breeding attire, shot by Dorrien-Smith on 29 April, 1890.

86. American Red-winged Starling. *Agelaius phoeniceus*, Vieillot

A specimen of this accidental visitor from N. America was shot at Swanpool, Falmouth, in August, 1881.

87. Starling. *Sturnus vulgaris*, Linn.

Up till 1854 only a winter visitor to the county, though in great numbers; that year a pair bred at Trebartha, and by 1860 fourteen pairs were breeding there. From 1855 to 1858 a single pair bred yearly at Bodmin; then they began to increase in numbers and to spread. They were first observed breeding at St. Germans in 1865 by Furneaux, at Liskeard in 1866 by Harris and Trathen, at Truro in 1873 by the late Alderman Worth, at Falmouth in 1887 by J. Tilly, at Camelford in 1890 by H. H. M. Lawrence, at Penzance about 1892 by A. W. Hawey, and at the Lizard about the same time by R. Harris. Enormous numbers still come in the autumn and leave in February and March. At Scilly it is one of the earliest of the winter visitors; its numbers fluctuate considerably during the winter, and at times many thousands roost in the reed-beds and low plantations on Tresco. As a rule, only a few stragglers remain after the middle of April.

88. Rose-coloured Pastor. *Pastor roseus* (Linn.).

A casual visitor of not infrequent occurrence in the west of the county from April to October. Probably many young birds pass unnoticed on account of the closeness of their resemblance to young starlings. One specimen was shot by Pechell at Scilly, probably in 1848, and another in June, 1892, by David Smith.

89. Chough. *Pyrrhocorax graculus* (Linn.).

This bird, still fortunately a resident with us, has been associated with Cornwall for over 400 years, though by no means confined to that county. Carew

(1602) speaks of it as a daw 'peculiar to Cornwall and there-through called a Cornish chough'; and the name was in use long before his time. Upton, a canon of Salisbury, writing about the middle of the fifteenth century, speaks of it as specially found in Cornwall (Newton). Camden, in his *Britannica* (1607), singles it out as the only bird of the county worthy of special comment. Till early last century it was common all round the Cornish coast. It used to breed at Looe, but Stephen Clogg (born 1812) could not remember it. It nested at Turbot Point, to the south of Mevagissey, till after 1820, at Kynance and Mullion till about 1832, at Tol-pedn-penwith, near the Logan Stone, till about 1849, and a nest was found at Trewavas Head in 1854. It used to be caught on the sands at Perran by means of barbed steel traps, and Dr. Bullmore says he has seen as many as five lying dead at one time, and that seven dozen used to be sent annually to Falmouth for sale during the game season. A nest was found on the cliffs near Zennor in 1870, and it may have bred there for a few years later. The last nest at Newquay was destroyed, along with the sitting bird, about 1882, and since that date it does not appear to have bred west of Mawgan Porth. In 1901 only seven nests could be found as the result of a careful survey of the coast between Newquay and Hennacliff. A less thorough examination in 1904 showed the presence of ten nests, and this year (1905) twelve have been recorded. The only example obtained at Scilly was shot by some fishermen during Christmas week, 1899.

90. Jay. *Garrulus glandarius* (Linn.).

Resident; common throughout the woodlands of the east and south as far west as Meneage, and locally in the north; a very scarce casual in the Penzance district. Has not been recorded for Scilly.

91. Magpie. *Pica rustica* (Scopoli).

Resident; very common throughout the county, including the Lizard and by no means confined to wooded districts. Two were blown over to Scilly from the mainland with a flock of rooks during a violent gale in October, 1859. One was shot at St. Agnes and the other on St. Helen's by Pechell.

92. Jackdaw. *Corvus monedula*, Linn.

Locally, Chaw.

Resident; has greatly increased in numbers during the past sixty years, and is now most abundant throughout the county. Occasionally carried over to Scilly by winter storms along with rooks, as in November, 1870, January, 1885, and November, 1901. On 2 November, 1905, a flock of about 400 put in at Tresco.

93. Raven. *Corvus corax*, Linn.

Resident and increasing especially about Launceston and in the north-east of the county generally; nests at intervals along the cliffs both on the north and on the south coasts, and regularly at many inland stations. A casual wanderer to Scilly, but appears to have bred at least once on Gorregan about 1840.

94. Carrion Crow. *Corvus corone*, Linn.

Resident; fairly general in the east and south of the county, but absent from much of the north coast. The only representative of the genus in permanent

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residence in Scilly, breeding regularly on the larger uninhabited islands.

95. Hooded or Grey Crow. *Corvus cornix*, Linn.

Locally, Marketjew Crow.

About a century ago fairly well known in the west of the county; now only a casual visitor, but not so rare as is generally supposed. Recent records include two at the Lizard in November, 1900, one at Lanreath and one on the Helford river in the autumn of the same year; one at Trengwainton in March, 1901; one on the Helford river, October, 1903, and one near Bodmin, December, 1904. An occasional visitor at Scilly from November to May. A few at times spend the greater part of the winter at Tresco, as in 1870-1, 1900-1, and 1903-4. One was shot by L. R. George at Holy Vale, St. Mary's, May, 1900; a flock of five spent some days there in the spring of 1901, and on 14 April, 1903, a solitary bird was seen, so that it may prove to be a spring bird of passage on that island.

96. Rook. *Corvus frugilegus*, Linn.

An abundant resident. In the autumn the rookeries in a district often unite into one enormous flock for roosting purposes, and come together at the same headquarters every evening like the starlings. A few are occasionally blown over to Scilly from the mainland, and usually remain till the spring. In the early fifties a whole rookery was driven over to Tresco in the autumn, and not only remained through the winter, but towards spring attempted to establish themselves near the Abbey, but the locality was unsuitable, and they gradually disappeared.

97. Skylark. *Alda arvensis*, Linn.

Resident, common and generally distributed; does not breed in as great numbers as in the midlands; large accessions in winter. At Scilly it breeds in small numbers, but during the period of autumn migration and irregularly throughout the winter arrives in large flocks.

98. Wood-Lark. *Alda arborea*, Linn.

Resident; local but probably often overlooked; appears to breed most commonly between Liskeard and Truro; occasionally seen in the east and in spring about Penzance; has not been recorded for the north of the county except about Newquay. A casual visitor to Scilly; two shot by Pechell behind the Great Rock, Tresco, 5 December, 1859; two at the same place by F. R. Rodd, 29 December, 1870; and one by David Smith in 1891.

99. Crested-Lark. *Alda cristata*, Linn.

An accidental visitor represented by two specimens shot by Vingoe between Penzance and Marazion in September, 1846; one by J. N. R. Millett near Penzance in October, 1850; and one by Gill, of Falmouth, at Budock Bottoms in December, 1865.

100. Short-toed Lark. *Alda brachydactyla*, Leisler.

An accidental vagrant, of which a single example was shot at Skirt Point, Tresco, by Pechell, 20 September, 1854; the only record for the county.

101. Shore-Lark. *Otocorys alpestris* (Linn.).

A casual winter visitor; two shot in the parish of St. Merryn, near Padstow, 30 October, 1879.

102. Swift. *Cypselus apus* (Linn.).

A summer migrant; common, in some districts abundant and increasing, but somewhat local; breeds not only about cottages, sea cliffs, and in hollow trees, but in colonies under the granite ledges on many of the Tors on the Bodmin moors. At Scilly it is an occasional bird of passage in small numbers, both in spring and late summer.

103. Alpine Swift. *Cypselus melba* (Linn.).

A rare accidental summer visitor. One specimen taken off the Lizard came into the hands of Jonathan Couch,¹ a second was obtained by Jackson of Looe, and on his death passed into the museum of the Royal Institution of Cornwall; a third was shot by Allen Daniel at Mylor in the summer of 1859, and is in the Rodd Collection at Trebartha Hall.

104. Night-jar or Goatsucker. *Caprimulgus europaeus*, Linn.

Locally, Dorhawk.

A summer migrant throughout the county; commoner in the east and middle than in the west, but nesting occasionally in the Land's End district. Not uncommon at Scilly in autumn. In August, 1901, Dorrien-Smith saw a great flock of these birds on Annett.

105. Wryneck. *Jynx torquilla*, Linn.

A casual autumn migrant, occasionally reported from the Liskeard district, the Lizard, and Scilly. Single specimens have been obtained at Trebartha, Carn Gulva, near Zennor, and Penzance. One was shot at Scilly by Dorrien-Smith, 4 April, 1893.

106. Green Woodpecker. *Gecinus viridis* (Linn.).

Resident and generally distributed throughout the county. Till forty years ago a rare casual visitor to the west, though well known in the east of the county from the Tamar to Lostwithiel; first nested near Truro about 1869, and at Falmouth in 1873, though stray birds were seen yearly about Tregothnan and the river Fal from 1866; first recorded as nesting at Penzance in 1882. Apparently non-migratory, but numbers increased considerably during the severe winter of 1894-5. A single specimen recorded for Scilly in September, 1901.

107. Greater Spotted Woodpecker. *Dendrocopus major* (Linn.).

Resident; up till 1877 bred regularly at Trebartha and Liskeard, and was only a casual visitor to the rest of the county. That year it nested at Doublebois, and has been slowly moving westward ever since. A nest was found near Bodmin in 1884, at Lostwithiel in 1891, at Tregothnan in 1897, and it probably nested at Enys (Penryn) about the same time. It is now common in trees close to Penzance, and in all probability has nested there for several years past. Has not been recorded from the Lizard.

108. Lesser Spotted Woodpecker. *Dendrocopus minor* (Linn.).

Resident; like the previous species was at one time known to breed only in the east of the county, but of late years has nested not infrequently about Tregothnan, and in 1904 near St. Columb; occasionally appears further west in the autumn and winter; probably often overlooked.

¹ Couch's *Cornish Fauna*, pt. iii, p. 147.

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109. Kingfisher. *Alcedo ispida*, Linn.

Resident; except in the Launceston district and on the Camel and the Fowey, scarcer now during the breeding season than formerly, but still widely spread throughout the county; more abundant in winter than in summer except about Launceston. Has occurred at Tresco, Bryher, St. Mary's, and Tean, and among the western rocks as an accidental winter visitor, almost always singly.

110. Roller. *Coracias garrulus*, Linn.

An accidental vagrant, obtained at least seven times in W. Cornwall, the two last records being Land's End, June, 1861; and St. Burian, October, 1887. Not recorded for Scilly.

111. Bee-eater. *Merops apiaster*, Linn.

A rare accidental straggler; four seen and two killed at Madron in 1807, twelve seen and eleven killed at Helston in May, 1828; one repeatedly seen at Scilly, June, 1878; two or three seen and one, a male, shot at Holy Vale, St. Mary's, in October, 1901.

112. Hoopoe. *Upupa epops*, Linn.

A regular spring visitor in small numbers, occasionally repassing in autumn. In 1901 a pair nested near St. Columb. Five eggs were laid, of which four were hatched, and the young birds were successfully reared. In April, 1903, five were seen together on Castle Down, Tresco.

113. Cuckoo. *Cuculus canorus*, Linn.

A summer migrant, not nearly so common as in the midland counties, but generally distributed; remarkably common about Truro in 1892; in most years common about the Lizard and at Scilly. At Holy Vale, St. Mary's, as many as nine have been seen at one time.

114. Yellow-billed Cuckoo. *Cuculus americanus* (Linn.).

A rare accidental straggler; one Cornish specimen referred to by Yarrell, and one picked up dead near Helston in October, 1887.

115. White or Barn Owl. *Strix flammea*, Linn.

Resident; formerly much commoner in the east than in the west of the county, but through foolish persecution now almost extinct in many districts; increasing about Launceston and St. Minver. A single specimen shot by Jenkinson, 13 November, 1858, is the only record for Scilly.

116. Long-eared Owl. *Asio otis* (Linn.).

A winter visitor in the east and throughout the south of the county, but a casual in the north; commoner in the west than in the east, but evidently local. Common at Scilly in autumn and winter, not infrequently occurring with the short-eared owl. Chiefly found on Tresco.

117. Short-eared Owl. *Asio accipitrinus* (Pallas).

Locally, Woodcock Owl.

A winter visitor to the greater part of the county and to Scilly, but most in evidence in the east on autumn migration; usually more abundant than the preceding species. In some years very common at the Lizard.

118. Tawny Owl. *Syrnium aluco* (Linn.)

Resident; generally distributed through the woodland districts, and in some places abundant.

119. Little Owl. *Athene noctua* (Scopoli).

A rare accidental straggler; one specimen killed at Constantine in 1828 and one at St. Keverne in 1830; subsequent records doubtful.

120. Snowy Owl. *Nyctea scandiaca* (Linn.).

An accidental straggler till lately represented by a single storm-battered specimen found near St. Germans in 1838, and recorded by Bellamy in his *Natural History of South Devon*, p. 201. Couch saw it in the Rev. Mr. Hore's collection, and mentions it in his *Cornish Fauna*.¹ In September, 1905, an adult bird was shot on St. Martin's, Scilly, and is now in the Abbey Collection.

121. Hawk Owl. *Surnia funerea* (Linn.).

A rare accidental wanderer; a single specimen of the dark American form taken in an exhausted condition from the rigging of a collier off the coast of Cornwall in March, 1830.²

122. Scop's Owl. *Scops giu* (Scopoli).

A rare accidental wanderer; one captured in an exhausted condition on Tresco, in the first week of April, 1847; one at Trevethoe, near Hayle, in January, 1871. Vingoe had two Cornish specimens that probably also came from Scilly.

123. Marsh Harrier. *Circus aeruginosus* (Linn.).

Now a rare casual, but formerly bred in the east of the county, where it was generally called the 'Moor buzzard'; nested every year in a tuft of stunted willows in the middle of Redmoor Marsh till about 1855, and up till 1863 stray birds were seen in that neighbourhood almost every year. Has been obtained several times in the Penzance district, once at Swanpool, Falmouth, and thrice at Scilly.

124. Hen Harrier. *Circus cyaneus* (Linn.).

A casual visitor of not infrequent occurrence; has been known to breed on Goonhilly Downs (F. V. Hill) and has nested in the county for the last three years; occasionally met with on the moors of the middle and west, but rarely of the east. Until about 1875 female hen harriers were to be seen at Scilly almost every year, though only one male had been shot. During the last twenty-five years one example only has been obtained, namely, in May, 1888.

125. Montagu's Harrier. *Circus cineraceus* (Montagu).

Has been a scarce summer migrant to the west of the county for at least forty years, but in the early fifties was a rare casual; still breeds in the Lizard district, where a bird was unfortunately killed in 1902, and another, an adult female, by mischance in April, 1903; stray birds occasionally recorded between Penzance and Truro, and at long intervals from the east and north. First recorded from Scilly in April, 1852, when three were shot, but apparently not seen again till April, 1868. It is still an occasional visitor, chiefly in the spring, and was seen on St. Martin's, 9 April, 1903.

¹ Op. cit. pt. ii, p. 69, App.

² Thompson, *Proc. Zool. Soc.* (1835), 77.

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126. Common Buzzard. *Buteo vulgaris*, Leach.

Resident; breeding now in considerable numbers from Boscastle to Marsland Mouth; nests also at Boconnoc, and at times on the Bodmin Moors; did so some years ago in the Land's End district, but lately birds seen there only at intervals and in the winter. A fairly regular passing autumn visitor to Scilly, singly or in pairs.

127. Rough-legged Buzzard. *Archebuteo lapopus* (J. F. Gmelin).

Now a rare casual, but formerly a summer migrant; in the forties Trathen and Geach used to find it breeding between Jamaica Inn and Bolventor. Trathen shot the last sitting female seen in the county at Gonzion Downs, Snaith, and took the eggs, prior to 1860. The only county records since that time are one in the Truro district, date uncertain, and one near Land's End in 1880.

128. Spotted Eagle. *Aquila naevia* (J. F. Gmelin).

An accidental visitor; one shot in Hawk's Wood, Trebartha Hall, on 4 January, 1860, by the gamekeeper, H. Couch, and another in November, 1860, at Carnanton, St. Columb, by Sam Gilbert, an innkeeper at Mawgan.

129. Golden Eagle. *Aquila chrysaetus* (Linn.).

A rare casual visitor; one immature specimen recorded by Couch¹ as the ring-tailed eagle; one killed on Lanherne Downs, in the parish of Mawgan, on 28 October, 1861.

130. White-tailed Eagle. *Haliaeetus albicilla* (Linn.).

A casual visitor of rare occurrence; an immature bird killed near Kilkhampton in November, 1844; an adult seen by Walter Pike, of Camborne, near Tehidy, in the autumn of 1877; a young bird killed at Bude Haven in November, 1893, and one seen by W. Waddon Martyn at Moorwinstow, in November, 1901. So far no eagles have been observed at Scilly, but there is a tradition of one of this species having been seen near The Seven Stones in 1835.

131. Goshawk. *Astur palumbarius* (Linn.).

Bellamy, in his *Natural History of S. Devon*,² says that a young bird of this species was shot at Falmouth in 1838. The specimen was seen by Stephen Clogg, of Looe, in 1866, who says 'It is a young bird of good size, but ruined by moth.'

132. Sparrow Hawk. *Accipiter nisus* (Linn.).

Resident; still common in the east, but in the west the number of nests has greatly diminished during the past ten years. Generally visits Scilly in the autumn with the starlings, but is never common there.

133. Kite. *Milvus icinus*, Savigny.

Bred in the county as late as 1842, but for many years a rare casual visitor; last county records, Trebartha, 1 December, 1869; Clowance, Camborne, 1882; Scilly, 9 September, 1890.

134. Honey Buzzard. *Pernis apivorus* (Linn.).

A casual visitor, in immature plumage, to the west, usually in autumn; eleven specimens recorded from the county, including one at Scilly, shot by Jenkinson

18 October, 1866; one at Hobb's Hill, Snaith, about 1860, one at Land's End in the autumn of 1901, one at Carclew 1902, and one at Ladock, near Truro, 21 October, 1904. There is strong presumptive evidence that this bird may have nested in the county as a very young male, with its primaries not full grown, and which, therefore, could not long have left the nest, was sent to Dr. Leach from Cornwall, and is now in the National Collection.³

135. Greenland Falcon. *Falco candicans*, J. F. Gmelin.

An accidental straggler; an adult female killed at Gwavas Grade, near the Lizard, in 1830; an adult male at Port Eliot, St. Germans, in 1834; one at the Lizard 24 March, 1884, and one at Scilly 27 March, 1903. A young falcon, either Greenland or Iceland, was shot at St. Just-in-Penwith in the winter of 1902-3. It may have escaped from the Norwegian bark *Luna*, which foundered with all hands off Pendean.

136. Iceland Falcon. *Falco islandicus*, J. F. Gmelin.

A rare straggler; represented by a single adult male, shot at St. Martin's, Scilly, by Dorrien-Smith, 15 January, 1895.

137. Peregrine Falcon. *Falco peregrinus*, Tunstall.

Locally, Blue Hawk, Cliff Hawk.

Resident; breeds at intervals all round the coast and occasionally inland. Down to 1854 at least, a pair bred regularly on Round Island, Scilly; then they alternated between Round Island and Menavawr, with an occasional pair on Castle Bryher, but they have not bred at Menavawr since 1896. Though a pair still nest at Scilly in most years, the old haunts appear to be quite forsaken.

138. Hobby. *Falco subbuteo*, Linn.

A not infrequent summer casual; in 1862 nested in the Old Plantation at Trebartha, and probably at Trelask, near Trebartha, in 1869. A specimen was shot by Jenkinson on St. Mary's Moors previous to 1863, and one was found dead near the telegraph wire on St. Mary's on 29 April, 1897.

139. Merlin. *Falco aesalon*, Tunstall.

A winter visitor, as a rule not uncommon on the eastern moors, but in the west of the county sometimes not seen for the year. A fairly regular autumn or winter visitor to St. Mary's, Scilly.

140. Red-footed Falcon. *Falco vespertinus*, Linn.

A rare accidental straggler; one seen by W. P. Cocks at Budock, Falmouth, in May, 1851;⁴ one obtained near Helston in the autumn of 1867. There was also a Cornish specimen in Vingoe's collection.

141. Kestrel. *Falco tinnunculus*, Linn.

Locally, Windhover, Hover Hawk, Criss Hawk.

A common resident, both in the county and at Scilly; breeds freely among the cliffs along the coast, and in smaller numbers inland; in the east of the county commoner in summer than in winter.

142. Lesser Kestrel. *Falco cenchris*, Naumann.

A rare accidental straggler; an adult male shot at Scilly, 3 March, 1891.

¹ *Cornish Fauna*, pt. i, p. 10.

² *Op. cit.* p. 198.

³ *Mag. Nat. Hist.* (1837), 339.

⁴ *Naturalist*, i, 163.

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143. Osprey. *Pandion haliaëtus* (Linn.).

A casual autumn visitor to the estuaries of the west and to Scilly, usually in immature plumage. At least eight specimens have been obtained since 1849, the last three being: one at Mawnan, Falmouth, in October, 1865; one at Pendarvis, Camborne, in the autumn of 1882, and one at St. Winnow, Lostwithiel, in March, 1903, which may have been the same bird that was seen by Clark at Godrevy and Lelant in September, 1902. One that used to roost on the flagstaff at the beacon on Castle Downs, Tresco, was shot by Pechell in September, 1849.

144. Cormorant. *Phalacrocorax carbo* (Linn.).

Resident; fairly common and thinly distributed along the coast and estuaries; more in evidence in the west and round the Lizard district than elsewhere; abundant at Scilly.

145. Shag. *Phalacrocorax graculus* (Linn.).

Resident, both in the county and at Scilly; much commoner as a breeding bird than the cormorant; not uncommon in the winter on Rosemary Pool and other inland waters.

146. Gannet or Solan Goose. *Sula bassana* (Linn.).

A common visitor to the Cornish coast all the year round, but most frequently seen in the autumn in small flocks. It flies westward in October, and returns with the pilchard shoals which migrate eastward along the south coast later on in the same month. It has never been known to breed in the county. It may be seen on the open seas round Scilly at all times, but does not as a rule come among the islands.

147. Heron. *Ardea cinerea*, Linn.

A common resident. There are heronries near Truro, Lostwithiel, Looe, and St. Germans, but so far as can be ascertained none in the north of the county. Herons, however, are to be seen at Scilly, and on most of the streams and shallow ponds of Cornwall all the year round. The Stack Rock between Tresco and St. Martin's, and Guthers between St. Martin's and St. Mary's can almost always show one or two birds, and twenty or thirty at a time is by no means an uncommon sight.

148. Purple Heron. *Ardea purpurea*, Linn.

An accidental straggler, chiefly to the west of the county; an adult shot at Killiow, Truro, about 1843; another at St. Burian, 8 April, 1850; a third on the Tamar, in 1851; a female killed at the Lizard in April, 1867; one in rufous immature plumage shot by Dorrien-Smith on St. Mary's Moors 30 August, 1878, and another immature bird at Scilly in April, 1898.

[Little Egret. *Ardea garzetta*, Linn.

Couch, in his *Cornish Fauna* (pt. i, p. 22), says of this species, 'One or two specimens are known'; and J. Brooking Rowe¹ speaks of 'one or two specimens on the Tamar.' In the absence of an authentic Cornish specimen, however, these statements are too vague to entitle the species to a place in the county ornith.

149. Squacco Heron. *Ardea rallioides*, Scopoli.

An accidental straggler in the spring, chiefly to the west of the county, including Scilly. Over twenty

specimens have been taken in the county, but none in adult plumage.

150. Night-Heron. *Nycticorax griseus* (Linn.).

A casual visitor, usually in April or May, of which eleven well-authenticated samples, chiefly adults, have been recorded for the county. A pair in adult plumage, shot near Hayle in the second week of May, 1869, suggested the possibility of its breeding in the county. A solitary example was knocked on the head by David Smith in a clump of bushes on Tresco 15 May, 1849.

151. Little Bittern. *Ardetta minuta* (Linn.).

A casual visitor, probably often overlooked; an adult female picked up in an exhausted condition on Coverack beach previous to 1850; an adult male shot at Tresco, Scilly, 13 June, 1866; an adult male captured in an orchard in the parish of St. Hilary 12 October, 1867; an adult female obtained at Skewjack, near Land's End, in the end of May, 1870; and an adult male, with a broken leg, picked up on Lostwithiel Parade early in August, 1901.

152. Bittern. *Botaurus stellaris* (Linn.).

A winter visitor in very irregular numbers, occurring annually on snipe marshes and swampy moors; particularly abundant in December, 1867, and in the winter of 1890-1. In one week in 1891 the Penzance taxidermist received seven specimens. Six or seven examples recorded for Scilly, including one on the marshes at Porthellick Bay, St. Mary's.

153. American Bittern. *Botaurus lentiginosus* (Mont.).

An accidental wanderer. A specimen in a very exhausted condition was picked up on Bryher in October, 1903, and is still alive in the aviary at Tresco.

154. Little Green Heron. *Butorides virescens* (Linn.).

The only British representative of this wanderer from tropical and temperate America was shot at Penrice, St. Austell, on 27 October, 1889, and exhibited at the Linnean Society in April, 1890, by Sir Charles Sawle.² The specimen is now in the museum of the Royal Institution of Cornwall.

155. White Stork. *Ciconia alba*, Bechstein.

An accidental straggler; in May, 1848, an adult bird killed in the Land's End district; one seen by F. Nicholls on White Marsh, Lostwithiel, November, 1885.

156. Black Stork. *Ciconia nigra* (Linn.).

An accidental autumn visitor; one killed on Beggar's Island in the Lynher in November, 1831; one at Scilly in September, 1887, and another in October, 1890.

157. Glossy Ibis. *Plegadis falcinellus* (Linn.).

An occasional accidental autumn wanderer to the west of the county and Scilly, always in immature plumage; has occurred at Scilly in 1854, 1866 and 1902; has also been shot at Paul and at Hayle; and in 1900 was obtained at Saltash, and again at Hayle.

158. Spoonbill. *Platalea leucorodia*, Linn.

A casual visitor, but by no means rare, appearing for the most part during the autumn migration; has

¹ *Trans. Plymouth Inst.* 1862-3.

² *Zoologist*, 1890, pp. 105, 181.

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been seen at irregular intervals throughout the whole county near the sea coast. Recorded for Scilly about half-a-dozen times in autumn and winter. An adult male, with well-developed occipital crest, was obtained there 7 June, 1850.

159. Grey Lag-Goose. *Anser cinereus*, Meyer.

A casual winter visitor to the west, single specimens of which were obtained at Marazion in March, 1862, at Hayle in November, 1875, at Falmouth in March, 1890, between Marazion and Penzance in the nineties, at Glendurgan, Falmouth, in December, 1901; thrice obtained at Scilly, namely, November, 1863, October, 1870, and two in October, 1885.

160. White-fronted Goose. *Anser albifrons* (Scopoli).

An occasional winter visitor in the west, and at long intervals at Looe; sometimes fairly common in severe weather. Two gaggles visited Tresco in October, 1854, three out of the second gaggle being shot by Pechell. Other records from Tresco are October, 1879, October, 1880, and during the winter 1890-1.

161. Bean Goose. *Anser segetum* (J. F. Gmelin).

A winter visitor, generally in evidence in severe weather, and often occurring in very large flocks both by the coast and inland. In the blizzard year (1890-1) great flocks were reported all over the county. Before a frost large flights are frequently seen at a great height in the air going westwards. None have been seen at the Lizard for some years. Has not been recorded from Scilly since the winter of 1890-1.

162. Bernacle Goose. *Bernicla leucopsis* (Bechstein).

A not uncommon casual winter visitor, little parties appearing in hard weather between Fowey and Land's End, and occasionally inland and at Scilly.

163. Brent Goose. *Bernicla brenta* (Pallas).

A winter visitor, not at all uncommon in the west, especially about Mount's Bay, where it often occurs in large flocks. During severe frost it keeps for the most part from half a mile to a mile out at sea. A bird in breeding plumage was shot by J. J. Hill, near Marazion, in May, 1897. The only recorded specimen for Scilly was obtained by Rodd, 1 October, 1860.

[Two specimens of the Canadian Goose, *Bernicla canadensis*, have been shot at Falmouth, one in 1860, and the other in 1871, and one at Scilly. An example of the Egyptian Goose, *Chenalopex Aegyptiaca*, was shot at Loe Pool in 1849, and another at Scilly in the fifties; while a spur-winged goose, *Plectropterus gambensis*, was obtained at St. Germans in 1821. All three species were most likely escapes from captivity.]

164. Whooper Swan. *Cygnus musicus*, Bechstein.

A casual winter visitor in small flocks after long-continued frosts; frequently reported from Scilly and the west, and once from Bude; several flocks observed from Truro westwards in 1890-1, and nine birds seen near Hayle early in February, 1895. The last appearance at Scilly was in January, 1895.

165. Bewick's Swan. *Cygnus Bewickii*, Yarrell.

A casual visitor in severe winters; not recorded on the mainland since the winter of 1890-1. A flock of twelve appeared on the ponds at Tresco, Scilly,

Christmas 1890, of which four were shot, and another flock of ten occurred in the winter of 1895-6.

166. Mute Swan. *Cygnus olor* (J. F. Gmelin).

One shot at Caspar Pool, Crowdy Marsh, in 1864, and several at Scilly in the winter of 1870-1.

167. Sheld Duck. *Tadorna cornuta* (S. G. Gmelin).

Locally, Burrow Duck.

Resident; breeding regularly and in increasing numbers at the mouth of the Camel; a frequent casual in hard weather in the middle and west of the county, including the Lizard; has occurred once at Saltash. Eight seen by Rodd on Tresco Pool in 1864, and one shot there in 1876.

168. Ruddy Sheldrake. *Tadorna casarca* (Linn.).

One shot on Helford river in 1892, the year of the great invasion.

169. Wild Duck or Mallard. *Anas boschas*, Linn.

Resident; breeding in small numbers in suitable localities throughout the county from Scilly to the Tamar; usually abundant as a winter visitor, and in hard winters immense numbers may be seen in the west. In 1903 nests were found on Samson, at Porthellick, St. Mary's, and on St. Helen's, Scilly.

170. Gadwall. *Anas strepera* (Linn.).

A casual winter visitor of which at least six examples have been procured in the county: one at Trengwainton Ponds, one at Gyllyngvase, one at St. Austell in 1864, one at King Harry Passage during the severe frost of 1881, one at Scilly 1 January, 1900, and one near Bodmin in January, 1905.

171. Shoveler. *Spatula clypeata* (Linn.).

A winter visitor, of late years at times the commonest duck on the Land's End pools, but as a rule sparsely scattered through the rest of the county; frequently shot at Scilly.

172. Pintail. *Dafila acuta* (Linn.).

Locally, Sea pheasant.

An irregular but frequent winter visitor from Helford river westwards; seen in the middle and east of the county only in very severe weather. In the winter of 1853 a farmer fired both barrels of a heavy duck-gun into a large flock on the Helford river, and killed thirty-seven pintail and one wigeon. Occurs only occasionally at Scilly and for the most part in severe weather.

173. Teal. *Nettion crecca* (Linn.).

Resident; breeding in small numbers on the Bodmin Moors, the Goss Moors, and on rare occasions further west; tolerably plentiful in autumn and winter in suitable localities; seen at Scilly every autumn and winter and at times very common.

[The North American Summer-Duck, *Aix sponsa*, was shot near Paul in 1896, and is in the possession of Haytor, the innkeeper at Gulval.]

174. Garganey. *Querquedula circia* (Linn.).

Locally, Summer Teal.

An irregular bird of passage in spring, not infrequent in the Penzance, Lizard, and Falmouth districts; rarely obtained elsewhere in the county; has occurred three times at Scilly, namely 29 March, 1881, March, 1883, and Christmas, 1900.

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175. Wigeon. *Mareca penelope* (Linn.).

A regular winter visitor sometimes in very large numbers all over the county, including Scilly, but usually most abundant in the west.

176. Red-crested Pochard. *Netta rufina* (Pallas).

A single specimen shot at Swanpool, Falmouth, in February, 1845, and examined in the flesh by W. P. Cocks.

177. Pochard. *Fuligula ferina* (Linn.).

A regular winter visitor to the west of the county, sometimes in small numbers; occurs irregularly at Scilly and along the south coast, but rarely on the north.

178. Ferruginous Duck. *Fuligula nyroca* (Guldenstädt).

A single specimen killed by some boys near Mylor, 11 March, 1905, during very stormy weather. The bird was immature and in good condition, but seems to have been exhausted or dazed.

179. Tufted Duck. *Fuligula cristata* (Leach).

An irregular but frequent winter visitor in small flocks to the south and south-west of the county; an occasional casual at Scilly and on the north coast. The unpinioned young at Trebartha used to leave in the autumn and return the following spring to breed.

180. Scaup. *Fuligula marila* (Linn.).

A scarce but probably regular winter visitor, occasionally in large numbers locally after heavy autumnal gales; seen about Truro every year from 1900 to 1904 inclusive. Occasionally recorded from Scilly.

181. Golden-eye. *Clangula glaucion* (Linn.).

Locally, Spotty Wigeon (female).

A regular annual visitor, sometimes in small numbers, to the freshwater pools throughout the county; not uncommon on the moors in frost; very common all along the south coast in the winter of 1890-1; a frequent visitor to Scilly.

182. Long-tailed Duck. *Harelda glacialis* (Linn.).

A casual winter visitor of which about a dozen solitary specimens have been obtained on the mainland and four at Scilly, all in immature plumage; usually occurs on the south coast, but has once been shot at Padstow, and once inland, at Trevithen.

183. Eider. *Somateria mollissima* (Linn.).

A casual winter visitor; one shot at Looe many years ago, two in immature plumage killed in 1864 on the Fowey river near Lostwithiel, a young male at Marazion in December, 1892, and a female killed at Tophiba, Marazion, about 1899. Six birds, all in immature plumage, have been shot at Scilly, three being killed in Tean Sound 18 December, 1891, after having been under observation for six weeks.

184. Common Scoter. *Oedemia nigra* (Linn.).

Locally, Black duck.

A winter visitor occurring in large flocks some miles out at sea; stragglers often driven into the creeks and estuaries by stormy weather. Seldom seen at Scilly; one in immature plumage killed on the west of Bryher in 1854, and six shot at Tresco in March, 1881.

185. Velvet Scoter. *Oedemia fusca* (Linn.).

A winter casual that has been recorded five times from the western mainland.

186. Surf-Scoter. *Oedemia perspicillata* (Linn.).

An accidental visitor obtained on two occasions at Scilly, one picked up half dead near Carn Thomas, St. Mary's, 22 September, 1865, and a young male shot off Skirt Point, Tresco, in October, 1867; once found in a mutilated condition near Pendennis Castle, Falmouth.

187. Goosander. *Mergus merganser*, Linn.

A casual winter visitor appearing on the south coast singly and at irregular intervals; obtained four times at Scilly and six times on the mainland. Last recorded for Scilly 5 January, 1884, when a female was obtained in perfect plumage.

188. Red-breasted Merganser. *Mergus serrator*, Linn.

A winter visitor of regular occurrence, but in small numbers; in some seasons, as in 1870-1 and 1894-5 abundant not only out at sea but on our tidal rivers; a fairly common winter bird at Scilly; always in immature plumage.

189. Smew. *Mergus albellus*, Linn.

A casual visitor of irregular occurrence on the south coast during very severe weather, chiefly between Penzance and Truro; almost invariably immature birds or females. On 13 January, 1891, three were seen on the higher moors, St. Mary's, Scilly, and two shot, both immature males.

190. Wood Pigeon. *Columba palumbus*, Linn.

Resident; abundant and generally distributed in the wooded districts throughout the county, including Tresco Abbey, and evidently increasing.

191. Stock-Dove. *Columba oenas*, Linn.

Locally, Culver.

Formerly a winter visitor throughout the county, sometimes in large flocks. In 1885 and 1886 a single pair bred at Trebartha; is now an established resident along the southern half of the county as far west as Helford, and locally in the north. Constantly seen at Scilly in the autumn on most of the larger islands, including Tean and St. Helen's.

192. Rock-Dove. *Columba livia*, J. F. Gmelin.

Locally, Cliff culver.

Formerly considered a casual visitor to the south of the county, but for some years has been a resident at intervals along the north coast from Moorwinstow to Tintagel, and on the south coast near Portscatho and elsewhere; not known with certainty to have occurred at Scilly.

193. Turtle-Dove. *Turtur communis*, Selby.

Aspring and summer visitor in very irregular numbers to the sheltered spots in the south of the county, but rare on the north; has nested once at Scilly, but no nest has ever been discovered on the mainland.

194. Pallas' Sand-Grouse. *Syrhaptes paradoxus* (Pallas).

Appeared in Cornwall during the remarkable eruptions both of 1863 and 1888. In the former an adult female was shot close by Land's End in the second week of June, and an adult male found dead on the 23rd of that month, on St. Agnes, Scilly. F. R. Rodd says there was a small flock on the island at the time. In 1888 a flock of eleven appeared in the Land's End district, of which three were killed and one captured alive. Several were shot by R. G. Lakes in the neighbourhood of St. Austell;

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several obtained on Tregoss Moors by Johnson Tellam, the father of the present keeper ; a flock of eight or ten was seen on St. Martin's, Scilly, by C. R. Gawen ; and one killed near St. Just in Penwith, in 1889.

195. Black Grouse. *Tetrao tetrix*, Linn.

Locally, Heath Poul.

Well-nigh extinct as a resident. Two nests were found on the Bodmin Moors in 1900, and one in 1904. In 1903 there was one nest on the Kilkhampton Moors, but none last year. For over fifty years now it appears to have been on the verge of extinction. Hybrids between the grey hen and cock pheasant occasionally occur. One such brood was seen by F. R. Rodd in Redmoor Marsh in the autumn of 1868.

196. Red Grouse. *Lagopus scoticus* (Latham).

A fine adult male was shot by William Henry Buscombe near Delank, Bodmin, in 1861, and is still in the possession of his daughter at Bodmin. The late H. J. Rowse of Carworgie shot one on Queen's Hill, St. Columb, in November of the same year.

197. Pheasant. *Phasianus colchicus*, Linn.

Abundant ; was successfully introduced into Tresco half a century ago by Augustus Smith, and is bred regularly every spring. Nearly all the Cornish birds show the influence of the Chinese ring-tailed *P. torquatus* in their markings.

198. Partridge. *Perdix cinerea*, Latham.

Resident, and where preserved as a rule abundant. In several districts in the north and west not a single covey may be seen for the year, and J. D. Enys says that at Enys only one covey has been seen during the last thirty years. Several attempts to introduce this species into Scilly have been made at various times, but have met with little success.

[Furieux, in some MS. notes dated 1879, says that the red-legged partridge, *Caccalis rufa*, has been shot at St. Germans. Dr. Hammond of Liskeard says that he has eaten specimens shot at Quethiock. The Barbary partridge, *Perdix petrosa*, was shot at Killiganon in the winter of 1865. A second example was obtained in the autumn of 1867 or 1868, close to St. Cleer. In all probability both of these species were introductions or escapes.]

199. Quail. *Coturnix communis*, Bonnatere.

A fairly common casual summer visitor throughout the county, and not infrequently breeding there ; unusually abundant in 1870, when it bred in considerable numbers at Trebartha, at Dosemary Pool, and about Bodmin, St. Columb, and Falmouth ; fairly plentiful in 1892 and in 1895, when several nested on the Bodmin Moors and west to the Helford river ; two nests found near Falmouth in 1899, and one close to Truro in 1904 ; has bred at least once at Scilly.

200. Corncrake or Landrail. *Crex pratensis*, Bechstein.

A summer migrant formerly abundant, but now rather scarce except on autumn migration ; occasionally seen during the winter ; breeds at Scilly.

201. Spotted Crake. *Porzana maruetta* (Leach).

A regular autumn and winter visitor to the snipe marshes throughout the county, except about Penzance, the Lizard, and the north coast, where it

appears for the most part to be a rare casual ; generally overlooked because of its small size and skulking habit ; bred in Crowdy Marsh in 1860 and again in 1862, and near Dosemary Pool in 1874 ; has twice occurred at Scilly.

202. Little Crake, *Porzana parva* (Scopoli).

A casual visitor that has been obtained at least twice in the county : once by a cat at St. Dominic, in March, 1878,¹ and once by G. Harrison, 25 October, 1892. A specimen was obtained by Pechell at Scilly in the early fifties.

203. Baillon's Crake. *Porzana bailloni* (Vieillot).

A casual visitor obtained at least four times from West Cornwall, namely from the pier basin, Penzance ; the neighbourhood of Zennor ; near Land's End in July, 1858 ; and from Marazion Marshes in October, 1877.

204. Water Rail. *Rallus aquaticus*, Linn.

Locally, Fencock.

Resident ; formerly tolerably common in places, now rather scarce ; still breeds near Bude, on the Bodmin Moors, sparingly on the Goss Moors, about Bishop's Wood, Truro, and till lately at St. Erth : in severe weather often abundant in the autumn at Scilly.

205. Moor Hen. *Gallinula chloropus* (Linn.).

Resident ; common, in some localities abundant, and generally distributed on marshy land, reed-beds, and ditches ; breeds at Scilly.

206. Coot. *Fulica atra*, Linn.

A scarce widely-diffused resident, but often abundant as a winter visitor and on migration ; nests sparingly on the Bodmin Moors, the Goss Moors, Marazion Marsh, and occasionally about Looe, Truro, and Falmouth ; thousands sometimes seen on the Loe Pool, Helston, in winter ; not known about Launceston, and only seen about Trebartha in severe weather ; common at Tresco, Scilly, in winter, a few remaining to breed.

207. Crane. *Grus communis*, Bechstein.

A solitary specimen frequented the banks of the Tamar for some time in the autumn of 1826, and was ultimately shot on the Devonshire side of the river ; one shot at Tresco, Scilly, 13 April, 1881.

208. Great Bustard. *Otis tarda*, Linn.

A casual winter visitor ; one recorded from Goonhilly Downs in 1843, one from St. Austell in 1854, and a third from Looe in December, 1879.

209. Little Bustard. *Otis tetrax*, Linn.

A casual winter visitor of which about twenty have been recorded for the county, chiefly from the west, though one has been obtained at Padstow, one at St. Columb, and one at Looe ; latest captures, St. Mawes, January, 1893, Constantine, December, 1904.

210. Stone Curlew, or Norfolk Plover. *Oedinenus scolopax* (S. G. Gmelin).

An irregular winter visitor in small numbers to the south and west of the county ; three obtained at Scilly ; frequently seen in the St. Ives district and at Looe. Cornwall seems to be on the northern limit of its winter habitat.

¹ See Gatcombe's account in the *Zoologist* of that year, p. 214.

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211. Collared Pratincole. *Glareola pratincola*, Linn.

An accidental vagrant ; one shot at Truro in September, 1811, and one, a fine adult male, near the Lizard, 9 June, 1874.

212. Cream-coloured Courser. *Cursorius gallicus* (J. F. Gmelin).

An accidental straggler killed at Mawgan near St. Columb in December, 1884.

213. Dotterel. *Eudromias morinellus* (Linn.).

An irregular bird of passage, always in small numbers, but commoner in spring than in autumn ; occasionally obtained on both journeys on the open moors on the south coast, but the spring birds for the most part follow a well-defined line on their journey through the county, and linger but little on the way.

214. Ringed Plover. *Aegialitis hiaticula* (Linn.).

Locally, Ring dotterel, Sea lark (see also Dunlin).

Resident ; fairly common in summer on several of our shingle beaches ; at Scilly breeds in considerable numbers ; in autumn large immigrant flocks spread round the coast and up the estuaries, and occasionally venture inland on to the higher marshes.

215. Little Ringed Plover. *Aegialitis curonica* (J. F. Gmelin).

An accidental straggler shot at Tresco, Scilly, by F. R. Rodd, in October, 1863, the only record for the county.

216. Kentish Plover. *Aegialitis cantiana* (Latham).

A rare casual ; one killed 17 April, 1852, on the flat sands between Penzance and St. Michael's Mount ; a second killed at the same place 17 April, 1858 ; one seen by David Smith on Tresco Pool in September, 1881, and one seen by A. W. Hawey near Penzance, 14 August, 1900.

217. Killdeer Plover. *Aegialitis vocifera* (Linn.).

An accidental straggler from the United States, shot at Tresco, 15 January, 1885. The bird, which was a female, had been frequenting the Long Pool for several days.

218. Golden Plover. *Charadrius plumialis*, Linn.

A regular winter visitor, often in immense quantities, but the numbers vary greatly, and during the course of the autumn and winter they fluctuate considerably in the same locality ; usually common in the winter at Scilly, and in severe weather, with a favourable wind, abundant. Occasionally large numbers may arrive in the county early in September, but as a rule the largest immigrant flocks appear from October onwards. Most of the birds leave by the end of March, but stragglers, at times in full breeding plumage, may sometimes be seen in May.

219. Grey Plover. *Squatarola helvetica* (Linn.).

A passing visitor in the spring and autumn, usually more frequent at the latter season, when it may linger for weeks ; not uncommon from Falmouth westward to Scilly, where the beach at Samson appears to be its favourite haunt ; not often reported from other parts of the coast, except in the north-east of the county. Immature birds may in most years be seen all through the winter in Mount's Bay ; in great abundance about St. Burian during the winter of 1887-8.

220. Lapwing. *Vanellus vulgaris*, Bechstein.

Locally, Horniwinck.

Resident ; breeding on the Bodmin and Goss Moors, at the Lizard, in small numbers in the Tamar valley, and occasionally on Carnon Downs, Truro, and Lady Downs, Penzance. Immense immigrant flocks or stands arrive during the autumn and winter ; extraordinarily abundant in the west of the county in the first fortnight of January, 1891. On 14 February, 1902, during a severe frost, a large stand invaded Truro. Common at Scilly throughout the autumn and winter, but does not stay to breed. On 13 February, 1902, a great flock three miles long passed over the islands.

221. Turnstone. *Streptilas interpres* (Linn.).

A passing migrant in spring and autumn, but in the west of the county not uncommon during the winter, and often seen in summer ; abundant at Scilly all the year round, and has apparently bred there.

222. Oyster-Catcher. *Haematopus ostralegus* (Linn.).

Locally, Sea Pie.

Resident ; during the last thirty years has gradually extended its breeding area from Scilly to Bude, and Looe. At Scilly breeds abundantly, and on the main-land nests in small scattered colonies. Small migratory parties occur in the spring and autumn, and large flocks are often seen in winter.

223. Avocet. *Recurvirostra avocetta* (Linn.).

An accidental straggler, of which five specimens have been obtained in Cornwall, namely one at Swanpool in November, 1845 ; one near Land's End, 13 September, 1847 ; one on St. Germans river, September, 1871 ; one near Truro in August, 1880 ; and one in the Cober valley near Helston, 21 April, 1900.

224. Black-winged Stilt. *Himantopus candidus* (Bonnaterre).

An accidental straggler shot at Swanpool, Falmouth, in 1851, and recorded by W. P. Cocks in the *Naturalist* for that year (p. 114).

225. Grey Phalarope. *Phalaropus fulicarius* (Linn.).

A passing migrant in autumn, and an occasional winter visitor of irregular but not infrequent occurrence ; only once obtained in the spring, namely, at Par in May, 1878. An occasional visitor at Scilly ; two obtained in October, 1857, one 14 September, 1877, one January, 1893, and another 6 December, 1902. Large flocks appeared in the county in 1846, in 1866, and in the autumn of 1891 ; a small flock seen on Truro river in November, 1904, and another of about twenty birds on 26 November, 1905.

226. Red-necked Phalarope. *Phalaropus hyperboreus* (Linn.).

A casual visitor in autumn, recorded from Scilly, Land's End, Helford, Swanpool, Looe, and Dosemary Pool. Generally occurs singly, but seven were counted in a large flock of grey phalaropes on the Helford river in October, 1891 ; most recent county record, Swanpool, 21 October, 1902.

227. Woodcock. *Scolopax rusticula*, Linn.

A winter visitor, as a rule fairly plentiful. The first flights generally arrive about the second week in October, and the birds leave early in March ; usually

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abundant at Scilly ; a nest with four eggs found at Callington in 1853 ; a solitary bird seen at Stratton early in August, 1890, and another about the same time of the year near Penzance in 1900, probably both birds of the year ; one seen at Clowance 24 June, 1905. An unusual flight occurred at Scilly at the end of January, 1881, and nearly fifty couples were killed:

228. Great Snipe. *Gallinago major* (J. F. Gmelin).

A casual autumn visitor to the drier snipe moors of the county, of which between thirty and forty examples have been found and recorded. Two specimens have been obtained at Scilly, one by David Smith on Great Ganilly in January, 1877, and the other almost at the same time, but the record has been lost.

229. Common Snipe. *Gallinago coelestis* (Frenzel).

Resident ; breeding locally in favourable situations throughout the county, but not so common as formerly ; far more abundant as a winter visitor ; usually very common in the winter at Scilly, but does not breed there. The very dark form known as Sabine's snipe has been frequently obtained.

230. Jack-Snipe. *Gallinago gallinula* (Linn.).

A winter visitor, generally distributed through the wet moorlands of the county, including Scilly ; as a rule not half so abundant as full snipe.

231. Pectoral Sandpiper. *Tringa maculata*, Vieillot.

An accidental straggler, of which eight examples have been obtained at Scilly, and one, in the early forties, at Falmouth.

232. Bonaparte's Sandpiper. *Tringa fuscicollis*, Vieillot.

An accidental straggler from North America, of which two were shot near Hayle in 1846, one at Scilly 11 October, 1854, another 10 October, 1870, at St. Mary's, and one at the Lizard a few days later.

233. Dunlin. *Tringa alpina*, Linn.

Locally, Sand Lark. Sea-lark, Purre (in winter plumage).

Resident ; breeding in small numbers in the large marshes around Brown Willy, and on the moors and turf-pits south of Jamaica Inn, and irregularly elsewhere. Large flocks of immigrant birds frequent the beaches and estuaries of the county the whole year round, but especially in winter. Common at Scilly during the winter in flocks with other small shore birds. Has been noticed there in May, but does not breed.

234. Little Stint. *Tringa minuta*, Leisler.

An occasional visitor on spring and autumn migration to marshes and pools by the sea in the west of the county. Swanpool, Falmouth, is the favourite resting place, but it has occurred several times at Hayle and at Marazion Marsh ; most recent record 12 October, 1903, between Hayle and St. Erth. Two examples were obtained at Scilly 19 September, 1857. They were identified first as Temminck's stint.

235. American Stint. *Tringa minutilla*, Vieillot.

An accidental straggler shot on Marazion Marsh in October, 1853, and near Penzance in September, 1890.

236. Temminck's Stint. *Tringa Temmincki*, Leisler.

A casual visitor in autumn at Marazion Marsh and St. Mary's, Scilly ; one specimen near Devoran, October, 1899 ; recorded altogether over a dozen times.

237. Curlew Sandpiper. *Tringa subarquata* (Güldenstädt).

A not infrequent casual visitor on autumn migration to our flat beaches from the mouth of the Fowey river round to Newquay and at Scilly ; rarely seen at the Lizard.

238. Purple Sandpiper. *Tringa striata*, Linn.

A fairly regular winter visitor to the south coast and Scilly, often seen outside Falmouth harbour and at Mount's Bay ; occasionally obtained at Looe, and frequently seen at Hayle. It generally leaves Scilly by the beginning of April, but a flock visited Annett in May, 1877.

239. Knot. *Tringa canutus*, Linn.

A passing visitor to our southern beaches, common in autumn, but usually scarce in spring. The first flocks arrive by the middle of August, sometimes earlier, and often linger for several weeks ; well known at Scilly.

240. Sanderling. *Calidris arenaria* (Linn.).

A passing visitor, sometimes in large flocks in spring and autumn, often remaining in small parties throughout the winter. In the west a few may be occasionally seen on the beaches during the summer ; a common winter visitor at Scilly.

241. Ruff. *Machetes pugnax* (Linn.).

A casual visitor during autumn migration occurring at intervals, and, as a rule, singly from Falmouth to Scilly ; one killed on the Davidstowe Moors about 1891 ; no specimen with the 'ruff' ever obtained in the county. Three specimens obtained at Scilly, one by Jenkinson in the autumn of 1864, one 2 September, 1878, on the Pool, at Tresco, and another by Jenkinson in March, 1885.

242. Buff-breasted Sandpiper. *Tryngites rufescens* (Vieillot).

An accidental straggler, obtained thrice in the county, once on the flat sands between Marazion and Penzance in September, 1846 ; once near Chun Castle, Morvah, in September, 1860 ; and once by Pechell at Bryher, Scilly, 16 September, 1870.

243. Bartram's Sandpiper. *Bartramia longicauda* (Bechstein).

An accidental straggler, obtained near Mullion, November, 1865 ; at St. Keverne, in October, 1883, and in the Lizard district in October, 1903.

244. Common Sandpiper. *Totanus hypoleucus* (Linn.).

Locally, Summer Snipe.

Resident, but commoner as a passing visitor in spring and autumn ; breeds in sandheaps by abandoned stream works on the moors, and by the side of streams and freshwater pools throughout the county ; leaves its breeding stations in July and August, and slowly makes its way to the coast. An irregular passing visitor to Scilly in early autumn.

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245. Wood-Sandpiper. *Totanus glareola* (J. F. Gmelin).

A passing visitor in spring and autumn, for the most part in immature plumage; in some years fairly common; has been shot in May and in June; may have nested in the county; a rare autumn casual at Scilly. An adult male was shot there 29 August, 1878.

246. Green Sandpiper. *Totanus ochropus* (Linn.).

A regular visitor in early autumn, singly or in small flocks, but has been observed in the county during every month of the year. Its occurrence and behaviour at times suggest it may be breeding, but no nest has ever been found; an early autumn visitor to Scilly.

247. Solitary Sandpiper. *Totanus solitarius* (Wilson).

An accidental straggler; one shot at St. Mary's, Scilly, 19 September, 1882, and one on Marazion Marsh in October, 1884.

248. Yellowshank. *Totanus flavipes* (J. F. Gmelin).

An accidental straggler shot at Marazion by Edward Vingoe, 12 September, 1871. J. Gatcombe, writing to E. H. Rodd a few days after its capture, says: 'There is great probability of its being the only authenticated British bird, as great doubts are expressed about Yarrell's bird.'

249. Redshank. *Totanus caladris* (Linn.).

A winter visitor, occasionally common, but usually in small numbers; in most years commoner as a passing migrant late in the autumn; remarkably abundant below Truro Quay in December, 1901, and January, 1902; for the last few years has been seen on spring migration, nested on the Goss Moors in 1904, frequently seen on the ponds at Tresco from early autumn till mid-winter.

250. Spotted Redshank. *Totanus fuscus* (Linn.).

A casual visitor occasionally met with in August on the western marshes, always in immature plumage; one shot on Bryher, Scilly, 26 August, 1870.

251. Greenshank. *Totanus canescens* (J. F. Gmelin).

A passing visitor in autumn and occasionally in spring to the brackish pools and tidal rivers; frequently solitary, sometimes in twos and threes; irregular in its appearance, except at Scilly, where it is a winter visitor, and often fairly plentiful.

252. Red-breasted Snipe. *Macrorhamphus griseus* (J. F. Gmelin).

An accidental straggler shot on the higher moors, St. Mary's, Scilly, by Pechell, on 3 October, 1857.

253. Bar-tailed Godwit. *Limosa lapponica* (Linn.).

A passing visitor in autumn, occasionally in large flocks, and almost always in immature plumage. Small flocks may linger on the sands and mudflats of the estuaries for weeks; in autumn and winter fairly common at Scilly.

254. Black-tailed Godwit. *Limosa belgica* (J. F. Gmelin).

An uncommon spring and autumn casual in the western half of the county, including Scilly; most recent occurrences, September, 1893, at Helford river, and October, 1904, near Camborne. The latest record for Scilly is one repeatedly seen on St. Mary's between 8 and 12 April, 1903.

255. Curlew. *Numenius arquata* (Linn.).

Resident; breeds on the moorland marshes throughout the county; spends the winter by the shore, coming up to the moors in March; frequents Scilly all the year round, but does not breed.

256. Whimbrel. *Numenius phaeopus* (Linn.).

Locally, Little curlew; Half curlew; May-bird.

A regular passing visitor in the beginning of May, and again from July to September; usually common in season all along the coast, but very rarely shot inland. Not so plentiful in the autumn at Scilly as formerly. It may, however, be a regular bird of passage there in the spring, as in May, 1903, there must have been several hundred on St. Mary's, and in April, 1904, several were seen on the beach at Tresco.

257. Esquimaux Curlew. *Numenius borealis* (J. R. Foster).

An accidental straggler shot at Tresco, Scilly, by Dorrien-Smith, 10 September, 1887.

258. Black Tern. *Hydrochelidon nigra* (Linn.).

A fairly regular passing visitor on both the north and south coasts in autumn, formerly rare on the return journey, but since 1901 has appeared regularly at Swanpool or Marazion, and once at Scilly in April or early in May, usually along with swallows and martins.

259. White-winged Black Tern. *Hydrochelidon leucoptera* (Schinz).

An accidental straggler, once obtained at Tresco, Scilly, 14 May, 1882, and once in 1887 at Sennen.

260. Whiskered Tern. *Hydrochelidon hybrida* (Pallas).

An accidental straggler, shot at Tresco, Scilly, on 2 September, 1851.

261. Gull-billed Tern. *Sterna anglica*, Mont.

An accidental straggler, killed at Tresco in May, 1852, and at St. Just, Penzance, in July, 1872.

262. Sandwich Tern. *Sterna cantiana*, J. F. Gmelin.

Until about fifteen years ago bred regularly at Scilly, and still does so occasionally; a frequent casual along our south coast from Looe westward in the autumn, and about Mount's Bay in the spring.

263. Roseate Tern. *Sterna dougalii*, Montagu.

Bred at Scilly as late as 1854, and seen there by F. R. Rodd in September, 1867; two specimens killed at Mount's Bay in 1842.

264. Common Tern. *Sterna fluviatilis*, Naumann.

A summer migrant, but more abundant as an autumn visitor on migration; in severe weather often seen in winter—occasionally, as in 1890-1, in very large flocks; breeds sparingly along the coast, and freely at Scilly, though the number there in nesting time is very much less than it was twenty years ago.

265. Arctic Tern. *Sterna macrura*, Naumann.

A summer migrant at Scilly, where in 1903 it was not so plentiful as the common tern, though twelve years ago it was the dominant species; on the mainland is common on spring and autumn migration, but is not known to breed.

266. Little Tern. *Sterna minuta*, Linn.

A summer migrant, still breeding in one locality; a not infrequent visitor to the west of the county in spring, sometimes in flocks, and occasionally reappearing

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on autumn migration. A casual visitor to Scilly; the latest recorded there seen on Bryher in April, 1904.

[Sooty Tern. *Sterna fuliginosa*, J. F. Gmelin.

In the autumn of 1883 David Smith saw a stranger tern, which he afterwards identified as the Sooty Tern, hawking flies near the Abbey Pool. As he was recovering from a severe illness at the time, he asked one of the servants to kill the bird, but the shot went wide and the bird flew off, and was not seen again.]

267. Sabine's Gull. *Xema sabinii* (J. Sabine).

An accidental wanderer appearing from August to December. At least sixteen specimens have occurred in the county, all immature birds, the most recent being one at Newlyn, October, 1891; one at Scilly in 1893; one at Wolf Rock, September, 1894; one at Pentillie, between Callington and Saltash, October, 1899; and one between Lostwithiel and Doublebois, November, 1902.

268. Bonaparte's Gull. *Larus philadelphia*, Ord.

An accidental straggler, of which three have been obtained in the county, namely, one in Falmouth Harbour, one at Penryn in January, 1865, and one near Newlyn by Vingoe, October, 1890; also seen on the Marazion beach by A. W. Hawey, 3 February, 1901.

269. Little Gull. *Larus minutus*, Pallas.

A casual visitor in late autumn and winter to the coast of the main-land from Falmouth westward. Over a dozen birds have been obtained in the county, of which the more recent are, one at Hayle and one at St. Just in 1889, one at Newlyn 1890, one at Penzance in 1891, one at Hayle 1896, one at Swanpool 1904, the last four being obtained in November. Has not been recorded for Scilly.

270. Black-headed Gull. *Larus ridibundus*, Linn.

Locally, Peewee.

A winter visitor, often in large flocks, especially on the south coast, including the Lizard; frequently occurs at Hayle in immense numbers; does not now breed in the county, though it formerly did so at Scilly.

271. Common Gull. *Larus canus*, Linn.

A fairly regular winter visitor throughout the county, usually in small parties, but occasionally in fairly large numbers; sometimes seen on spring migration. Appeared in considerable numbers at Scilly in the autumn of 1863, and has been occasionally noted in small winter parties.

272. Herring Gull. *Larus argentatus*, J. F. Gmelin.

Resident, nesting all round the coast and at Scilly; often seen inland in spring and early summer.

273. Lesser Black-backed Gull. *Larus fuscus*, Linn.

Locally, Black Annie.

Resident; breeds abundantly in Scilly, and on Mullion Island and Gull Rock, Falmouth; in small numbers at Kynance, Gurnard's Head, Perranporth, and only occasionally farther east; very common in winter and early spring, though very rarely seen then at the Lizard.

274. Greater Black-backed Gull. *Larus marinus*, Linn.

Locally, Big Black Annie.

Resident; breeds at Scilly, and a few pairs nest annually at the Lizard and at two or three places on the north coast.

275. Glaucous Gull. *Larus glaucus*, Fabricius.

A casual visitor from December to March, often solitary, and at very irregular intervals; fairly common in January, 1873, and in January, 1895; twice shot at Scilly, namely in Pentle Bay, Tresco, in 1874, and at Carn Nea, Tresco, in 1885.

276. Iceland Gull. *Larus leucopterus*, Faber.

A casual winter visitor to the coast and to Scilly; most frequently seen from December to February; appeared in large numbers in January and February, 1873, in the winter of 1874-5, and again in January, 1895. The latest record for Scilly is one seen in December, 1890.

277. Kittiwake. *Rissa tridactyla* (Linn.).

Resident; bred regularly at Scilly up till 1900; still nests, but in diminishing numbers at Mullion Island, on the Gull Rock, Falmouth, and on a cliff on the south coast; in evidence at all times round the coast, especially in winter.

278. Ivory Gull. *Pagophila eburnea* (Phipps).

An accidental straggler, obtained once at Quilquay, Trefusis, and once at Penzance in February, 1847.

279. Great Skua. *Megalestris catarrhactes* (Linn.).

Often seen a few miles out at sea during the herring and mackerel season; exceptionally abundant off the south coast in the autumn of 1891; occasionally seen flying west off the Lizard signal-station in October; stragglers occasionally met with in the estuaries.

280. Pomatorhine Skua. *Stercorarius pomatorhinus* (Temminck).

A casual autumn visitor of somewhat uncertain appearance, but evidently increasing in frequency, as it has been noted every year since 1900 between Truro and the Helford river; occasionally appears in large flocks on the south coast, as in 1879 and 1891; one shot at the Manacles, 15 June, 1883, and one seen at Bossiney Cove, Tintagel, 31 July, 1903. The skuas have to some extent been overlooked at Scilly. In September, 1895, on the Powll Banks, Dorrien-Smith fed a pomatorhine skua and four great shearwaters with bait within two or three feet of the boat.

281. Richardson's Skua. *Stercorarius crepidatus* (J. F. Gmelin).

A rare casual visitor; one specimen obtained at Rosemullion over forty years ago, and one near Mevagissey in 1879. One seen on Guthers, Scilly, in June, 1852, and another shot on St. Mary's, Christmas, 1901.

282. Buffon's Skua. *Stercorarius parasiticus* (Linn.).

A casual visitor in autumn and winter, represented by three Cornish specimens till the autumn of 1891, when a large flock visited the south-west of England, and the bird was seen in numbers at Polperro and Fowey.

283. Razor-bill. *Aka torda*, Linn.

Resident; breeds in great numbers at Scilly, and on the Gull Rock, Falmouth, and in colonies at many places both on the north and south coast.

284. Common Guillemot. *Uria troile* (Linn.).

Resident; with the same breeding range as the razor-bill, but not nearly so abundant. The ringed guillemot has been obtained several times.

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285. Brünnich's Guillemot. *Uria bruennichi* (E. Sabine).

An accidental straggler, shot about 1858 by George Copeland at Rosemullion.¹

286. Black Guillemot. *Uria grylle* (Linn.).

A casual visitor, represented by a specimen obtained at Mount's Bay, another at Gyllyngvase, and a third picked up dead near the St. Anthony Lighthouse, Falmouth, 12 March, 1905, during very stormy weather.

287. Little Auk. *Mergulus alle* (Linn.).

A winter visitor, evidently appearing annually round the coast and driven into the estuaries in stormy weather; has been seen about Falmouth for the last six years; one picked up dead on St. Agnes, Scilly, about midwinter, 1900.

288. Puffin. *Fratercula arctica* (Linn.).

Locally, Welsh Parrot, Sea Parrot.

Resident; breeding in immense numbers at Scilly, in considerable numbers about Tintagel and Trevalga, and in small colonies at two or three localities on the south coast; single specimens not unfrequently found inland in severe winters; at the Lizard an autumn migrant, flying westward in considerable numbers.

289. Great Northern Diver. *Colymbus glacialis*, Linn.

A winter visitor to the south coast, increasing in numbers in the west of the county; common at Scilly. It occasionally occurs in small flocks, and in some seasons is fairly abundant, as in 1874-5, 1886-7, 1890-1, and at Scilly in 1901-2. The birds are usually, though not always, in immature plumage.

290. Black-throated Diver. *Colymbus arcticus*, Linn.

A casual autumn and winter visitor to the south coast from St. Germans to Mount's Bay; scarce at all times, and irregular in its visits; since 1890 has been not infrequently seen at Portscatho. A specimen, reported by Stephen Clogg, from Looe, in June, 1879, is the only one seen and recorded in full summer plumage.

291. Red-throated Diver. *Colymbus septentrionalis*, Linn.

A regular winter visitor off the south coast, of fairly common occurrence, but numbers fluctuate considerably from year to year; once shot at Scilly by David Smith, in the spring of 1894.

292. Great Crested Grebe. *Podiceps cristatus* (Linn.).

A regular winter visitor, not uncommon on our south coast and on the marsh pools in the Land's End district seen in flocks of twelve to fifteen; only twice obtained in its remarkable summer plumage.

293. Red-necked Grebe. *Podiceps grisegena* (Boddaert).

A winter visitor, appearing annually along the south coast; usually scarce, but in some years plentiful, as in January, 1891, January, 1895, and in December and January, 1901-2; only two specimens obtained in full nuptial plumage, though birds are occasionally obtained in the spring with the red neck feathers just showing.

294. Slavonian Grebe. *Podiceps auritus* (Linn.).

A casual winter visitor, formerly confined to the Land's End district, but now not uncommon some years in estuaries and creeks round the coast; observed

in considerable numbers at Padstow early in 1900, and from 1898 to 1903 seen every winter on the Fal; occasionally obtained at Scilly; never seen in summer plumage.

295. Eared Grebe. *Podiceps nigricollis* (Brehm).

A casual winter visitor, occurring at intervals of two or three years in most of our estuaries, but most frequently on Helford river and creeks of the Fal; twice shot at Scilly; obtained at least three times in nuptial plumage.

296. Little Grebe or Dabchick. *Podiceps fluviatilis* (Tunstall).

Locally, Dipchick.

Our only resident grebe, nesting in small numbers in suitable localities throughout the county; rare inland during winter and scarce at the Lizard, but fairly common in flocks of six to ten at Looe, on the Fowey, Fal, and Helford rivers; not infrequent at Scilly in autumn and winter.

297. Stormy Petrel. *Procellaria pelagica*, Linn.

Locally, Pinnick (see also Rock Pipit).

Resident; breeds on Annett and in greatly diminished numbers at Rosevear, Scilly, at the Godrevy Rocks near Hayle, and probably at the Logan Rock, and near Tintagel; in 1866 bred on the Gull Rock, Falmouth; occasionally driven on to the land by stormy weather in winter, large flocks appearing in 1891, and at least one flock of about thirty in the middle of March, 1905.

298. Leach's Petrel or Fork-tailed Petrel. *Oceanodroma leucorhoa* (Vieillot).

An occasional winter visitor, not often seen except after violent gales or during long-continued stormy weather, when birds appear not only in our estuaries but may at times be picked up dead or exhausted many miles inland, occasionally even in the heart of the Bodmin Moors.

299. Wilson's Petrel. *Oceanites oceanus* (Kuhl.).

An accidental storm-driven waif picked up dead at Polperro in 1838.

300. Great Shearwater. *Puffinus gravis* (O'Reilly).

Locally, Hackbolt.

A fairly regular visitor in autumn and winter to Scilly, but being essentially oceanic is not often seen from the main land. In August, 1899, large numbers appeared off the south coast; has been reported recently from Bude and Hayle.

301. Sooty Shearwater. *Puffinus griseus* (J. F. Gmelin).

For many years confused with the great shearwater; but there are Cornish specimens in the museum of the Royal Institution of Cornwall, and in the collection of the late W. E. Bailey of Penzance; one shot at Looe, 21 August, 1899.

302. Manx Shearwater. *Puffinus anglorum* (Temminck).

Locally, Cockathodon.

Resident; breeding in immense numbers on Annett, Scilly, and in a small colony near Newquay; large flocks pass the Lizard every autumn. The Scillonian birds go out to sea in August, and are rarely seen again till the spring.

303. Fulmar. *Fulmarus glacialis* (Linn.).

A casual winter visitor of which at least ten specimens have been found on the south coast, and three on the north.

¹ Bullmore, *Cornish Fauna*, 39.

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The mammalian fauna of Cornwall is very representative, but contains no species of limited distribution or of unexpected occurrence except the grey seal. The scarcity of woods over the greater part of the country has no doubt had some influence on the occurrence and distribution of the terrestrial mammals, but the larger carnivora—the badger, the fox, and the polecat—have their stronghold not so much in the interior as in the rough broken cliff-land of the coast. The smaller land species have unfortunately received very little attention, and the bats have apparently been ignored by local observers for more than forty years. The country distribution of the bats in particular is very imperfectly known, and the list of county species may not yet be complete. The geographical position of Cornwall and the long extent of seaboard suggest great possibilities as regards marine forms, but in the past the identification of the Cetacea has too often been a matter of assumption than the result of competent examination.

The most noteworthy features of Cornish mammalian life on land are the abundance of the badger and the otter, and the persistence of the polecat. The badger is distributed throughout the entire county and is locally very plentiful both inland and near the sea. In several places in the cliff on the north coast the badger and the fox have made earths together and appear to live in perfect harmony. In the almost impenetrable oak scrub between Millook and Dizzard Head the mixed population is relatively dense, though the foxes, of course, are greatly in the minority. The otter is almost ubiquitous, and the paths made by its traffic are often very much in evidence. Lately it has been more than usually conspicuous in the upper reaches of the streams from Bodmin Moors, where they pass over the edge of the plateau and tumble down over a rocky bed to the lowland beneath. The polecat is perilously near extinction, but still breeds on rough, lonely cliff-land on the north and probably in one or two places on the south coast as well. In spite of the efforts of gamekeepers the stoat and weasel are still plentiful. The smaller rodents, too, are abundant, and even the bank vole may prove to be fairly common when better known.

Whales, dolphins, grampuses, and porpoises are all fairly well known visitors to the Cornish seas, but the chief interest in the marine mammalia appears to centre round the seals of the Bristol Channel and the Land's End and the grey seals that are almost always so conspicuous among the western islands of the Scillonian archipelago.

Jonathan Couch in his *Cornish Fauna* and elsewhere, Dr. W. P. Cocks in his often-quoted *Fauna of Falmouth* (1849), and Dr. W. K. Bullmore in his lengthy article on the Cornish Vertebrate Fauna in the *Report of the Royal Cornwall Polytechnic Society* (1861), laid an excellent foundation to

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our knowledge of the county mammalia, but since that time the subject has been unaccountably neglected. In 1878 Mr. J. Brooking Rowe revised the mammals in Couch's *Cornish Fauna* for the Royal Institution of Cornwall, but beyond incorporating the results of Cocks and Bullmore, did not add much that was new. The only one of the Penzance naturalists who gave attention to the subject was the late Mr. T. Cornish, who unfortunately published nothing beyond a few notes. Mr. J. C. Tregarthen, in his *Wild Life at the Land's End* (1903), gives many strong sympathetic word-pictures of the animal life of the district, but in such a work the majority of the mammals are naturally omitted. The last-named naturalist has most kindly supplied the writer with a number of valuable notes on the larger carnivora of the county, and hearty thanks are due to him not simply for his welcome help, but still more for the spirit in which it has been given.

CHEIROPTERA

1. Greater Horse-shoe Bat. *Rhinolophus ferrum-equinum*, Schreber.

Several previous writers on the mammals of the county speak vaguely of this bat being rare, but beyond Bullmore's statement, on the authority of Cocks, that it has been found in a cave situated between Swanpool and Pennance Head, Falmouth, no details appear to have been published as to the occurrence or capture of a specimen west of the Tamar. Up till a few years ago there was a dilapidated example in the museum of the Royal Institution at Truro marked 'Looe, 11th September, 1862,' but its history could not be traced. In May, 1901, one of the Liskeard agricultural students brought in an adult female that had been killed in the neighbourhood a few evenings before. The head and body measured 2.25 in. in length, and the tail 1.35 in.

2. Lesser Horse-shoe bat. *Rhinolophus hipposiderus*, Bechstein.

This bat is locally common throughout the county. Couch says, 'In the neighbourhood of Trelawny House this species abounds almost to the exclusion of every other.' It has been captured at Launceston, and a specimen was procured on request by C. Upton Tripp at Altarnun. It has been obtained at Liskeard, near Fowey, is found occasionally around Truro and Falmouth, and has been reported from Penzance, and either this or the preceding species from Newquay.

3. Long-eared Bat. *Plecotus auritus*, Linn.

This bat well deserves its common name, as its flexible ears are nearly as long as its body. It appears to be common and generally distributed throughout the county.

4. Barbastelle. *Barbastella barbastellus*, Schreber.
Bell—*Barbastellus daubentonii*.

This species was obtained by Cocks from a cave to the west of Maenporth Bay, and has been reported from the Lizard and from Newquay, but no specimen has been recorded from the county for the last ten years.

5. Serotine. *Vespertilio serotinus*, Schreber.
Bell—*Scotophilus serotinus*.

One specimen is recorded from Tintagel in Dobson's *Catalogue of Cheiroptera* in the British

Museum, and one was obtained near Newquay in 1902 by Mr. W. Thomas, who says it is not uncommon about Porth.

6. Pipistrelle. *Pipistrellus pipistrellus*, Schreber.
Bell—*Scotophilus pipistrellus*.

The flittermouse is decidedly the commonest bat in Cornwall, and appears to be generally distributed all over the county and at Scilly. It has been seen on the wing about Truro in every month of the year. Couch speaking of this bat in Cornwall says, 'It flies at all seasons of the year if the thermometer be not much below 50° F. It awakes in a few hours after the weather has become mild and is not uncommonly seen abroad in the middle of a fine day.'

7. Natterer's Bat. *Myotis nattereri*, Kuhl.
Bell—*Vespertilio nattereri*.

Two specimens of this bat were obtained by Couch from Looe in September, 1852, and Harting, in the *Zoologist* for 1889, gives Cornwall as coming into its area of distribution. In the autumn of 1900 a bat 'quite white below' was reported from the Lizard, and two years later a specimen was obtained, which the hairs on the feet and the bristly margin to the interfemoral membrane towards the tip proved to belong to this species.

8. Daubenton's Bat. *Myotis daubentonii*, Leisler.
Bell—*Vespertilio daubentonii*.

This species was first recorded for the county by Couch in the *Zoologist* for 1853. Bullmore in his *Cornish Fauna* gives three instances of its capture in and around Falmouth, and Cocks describes it as not uncommon in that neighbourhood. In 1900 Mr. M. H. Williams sent in a specimen for identification from Pencalenick near Truro, and bats probably of this species are not infrequently seen flying persistently backward and forward over the surface of the ponds there. It is reported by Thomas from near Lostwithiel, and two years ago an example was killed near Constantine.

9. Whiskered Bat. *Myotis mystacinus*, Leisler.
Bell—*Vespertilio mystacinus*.

The only record of the occurrence of this bat in the county is one that was killed near Fowey in the late summer of 1901 by R. O. Waters of Truro.

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INSECTIVORA

10. Hedgehog. *Erinaceus europaeus*, Linn.

The 'hedge boar' as it is called locally is common throughout the county, but apparently does not occur at Scilly.

11. Mole. *Talpa europaea*, Linn.

Abundant almost everywhere.

12. Common Shrew. *Sorex araneus*, Linn.

Plentiful and generally distributed; generally active throughout the winter.

13. Pigmy Shrew. *Sorex minutus*, Pallas.

Bell—*Sorex pygmaeus*.

This species does not appear to have been hitherto recorded for the county, but is widely distributed though probably scarce. The first Cornish specimen seen by the writer was in 1900 at Launceston, where it had been captured alive at the castle. One was brought in the following year by one of the agricultural students at Liskeard. F. J. Polkinghorn trapped it twice at Bodmin, and it has been taken three or four times in the Truro district.

14. Water Shrew. *Neomys fodiens*, Pallas.

Bell—*Sorex fodiens*.

Numerous and well known throughout the county.

CARNIVORA

15. Fox. *Vulpes vulpes*, Linn.

Bell—*Vulpes vulgaris*.

Generally distributed in suitable localities throughout the county; specially common in cliffs by the sea.

16. Pine Marten. *Mustela martes*, Linn.

Bell—*Martes abietum*.

This species was no doubt common in bygone days, but gradually disappeared as the forests were destroyed. Couch, writing in 1854, believed it was extinct in the county. 'The last specimen I have been informed of,' he says, 'was killed near Liskeard in the first quarter of the present century, and its loss (for it was in ancient times classed with animals of the chase, and its fur was in high esteem) may be ascribed to the change of habits in society, by which the common use of mineral coal was introduced among farmers. Before that time a large number of pollard trees were permitted to grow in the neighbourhood of town-places or farm-yards for the purpose of supplying the house with fuel, and the cavities which most of them contained afforded a safe shelter to these and the others of the weasel tribe. When such fuel became of less importance these hollow trees were gradually cut down or suffered to fall, to the great diminution of the numbers of the weasel tribe.'¹ Somewhere about 1843, however, a pack of foxhounds in drawing Bodethiel Coombe in the Glynn valley near Bodmin, found and killed a marten, and the late Mr. E. H. Rodd, who recorded the fact,² added that in March, 1878, a full-grown marten was obtained in the neighbourhood of Delabole Quarries. There is a Cornish

marten in the museum of the Royal Institution of Cornwall at Truro, but its history is not known.

17. Polecat. *Putorius putorius*, Linn.

Bell—*Mustela putorius*.

The polecat or fitcher can scarcely be called rare in Cornwall, as hardly a year passes without a specimen being recorded from the county. It shows a liking for wild, tangled places, especially near the cliff. During the last seven years the writer has seen specimens from Launceston, from between Boscastle and Tintagel, from near Chacewater, and from the Land's End district, and examples have been reported from Looe and Bodmin. One reported in 1901 from near Gerrans was undoubtedly a domestic cat that had run wild, and mistakes of this kind probably occur from time to time. It is not nearly so plentiful as it was twenty years ago.

18. Stoat. *Putorius ermineus*, Linn.

Bell—*Mustela erminea*.

Common and generally distributed. In 1901 a pair of stoats bred under Boscawen Bridge in the city of Truro, and they and members of their family were frequently seen on the island below the bridge. In 1904 stoats were seen there for the last time, and recent improvements will of course prevent their re-appearance. White and pied stoats are occasionally met with. Examples in perfect winter pelage are very rare, but a stoat with only a triangular speckled patch of brown and white between the ears and nose and the customary black tip to the tail was caught at Killiow during the blizzard of 1891. Specimens that have assumed a partial winter dress are not uncommon. Pied and white stoats are well represented in the Museum of the Royal Institution, Truro.

19. Weasel. *Putorius nivalis*, Linn.

Bell—*Mustela vulgaris*.

The weasel or 'whitneck' is generally distributed and on the whole common. Winter pelage is less frequently assumed by the weasel than by the stoat, but white and pied local specimens are preserved in the Royal Institution Museum at Truro.

20. Badger. *Meles meles*, Linn.

Bell—*Meles taxus*.

This animal is very common and so generally distributed that there are few if any parishes in the county in which it may not be found. In a letter of January, 1906, Mr. J. C. Tregarthen informs the writer that he believes it to be more numerous than ever, and refers to the increasing number of badger-earths each year; he also remarks that there is hardly a croft which it does not traverse in its beats or in which it has not an earth. The badger is very common in the Fourburrow country, around Scorrier, and in suitable localities throughout the whole of the Truro-Falmouth district. It is very plentiful around Bodmin, Liskeard, Looe, and Launceston. On the north coast it is in places astonishingly abundant. It frequents more especially the woodlands and the cliffs, but often occurs in numbers in deserted mine shafts and works.

21. Otter. *Lutra lutra*, Linn.

Bell—*Lutra vulgaris*.

The otter is also plentiful throughout Cornwall, and there is probably not a stream or pond in the

¹ Report of Royal Cornwall Polytechnic Society (1854), pp. 25-6.

² Zoologist (1878), p. 127.

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county which is not visited annually by this wandering tribe. It is commoner on the rivers, estuaries, and open sea on the south coast than on the Bristol Channel side, though evidently not uncommon along the whole length of the Camel. Speaking of the otter, Couch says: 'By far the greatest portion of these creatures in Cornwall derive their food from the sea, where they may be seen diving for fish even when the waves are very tempestuous. Several instances are known of their being drowned in crab-pots, into which they had entered in search of prey and had not afterwards been able to find the opening.' Though occurring frequently in the open sea and in caves along the south coast and occasionally in the estuaries of the Looe river, the Fowey, and the Fal, it does not appear to be so marine in its habits now as formerly, and seems to prefer the rocky streams to all other habitats. During the last forty years it has been reported in crab-pots about half a dozen times.

22. Common Seal. *Phoca vitulina*, Linn.

The common seal occurs along the north coast from Moorwinstow to Land's End. A few frequent the cliffs near Cape Cornwall and even the castle caves near Castle Treryn close to the Logan Rock, but it is not often seen along the south coast, and most of those reported from the Channel are otters. One, however, was killed at Whitsand Bay in 1861, two were seen several times by Marryat near Polperro in 1890, and Matthias Dunn saw it occasionally on the rocks about Gorran. The lonesome character of the littoral and the many caves in the slate by the Severn Sea no doubt explain its preference for the northern shores of the county, where it undoubtedly breeds in small numbers. Baby seals have also been seen on the beaches at Porthcurnow and Porthgwarra, and once on Whitsand Bay, Land's End.

Ray, in his *Itinerary*, speaks of the soils (seals) he saw at the Longships; while Borlase mentions them in his *Natural History of Cornwall*. These references, together with the carvings of this mammal on the pew ends at Zennor Church and the many legends of mermaids in the folk-lore of the county, show that the seal is not a recent settler as has been suggested, but has been a denizen of the Cornish seas for centuries.

This species is completely replaced at Scilly by the grey seal, as Mr. Dorrien-Smith only knows of one killed there during the last forty years.

23. Grey Seal. *Halichoerus gryphus*, Fabr.

The Isles of Scilly are the headquarters of this fine seal. Mr. T. A. Dorrien-Smith, the lord proprietor of the isles, writes: 'Undoubtedly the grey seal exists at Scilly, and in considerable numbers. I have seen as many as a dozen on a rock together and twenty or thirty on one small group of islands at the same time. The largest we have killed weighed 672 lb., just 6 cwt., and I have often seen them up to 5 cwt.' On Roseveare, Rosevean, Gorregan, and the western islands generally they are almost always in evidence. When Mr. J. G. Millais visited Scilly in May, 1903, for the purpose of securing a specimen, he saw six on a rock on his first introduction to their haunts. On the writer's first visit he counted seventeen one day on Rosevean and Gorregan, and their presence was so commonplace as scarcely to excite remark from the boatmen. Several white pups of the grey seal have been taken on the Cornish mainland from time to

time, but Millais thinks it improbable that they breed there. Adult specimens are occasionally seen on the north coast near Zennor, Newquay, Padstow, and Boscastle, and on the south coast to the west of Penzance.

RODENTIA

24. Squirrel. *Sciurus leucourus*, Kerr.

Bell—*Sciurus vulgaris*.

The squirrel is abundant throughout the Truro and Falmouth districts, but does not seem to occur further west than Tehidy, while in many parts of the eastern half of the county it is scarce or altogether wanting.

25. Dormouse. *Muscardinus avellanarius*, Linn.

Bell—*Myoxus avellanarius*.

The 'dory mouse' is widespread throughout the county, but somewhat local. Though apparently scarce in the Hayle, Camelford, and Callington districts, it is common in places about Bodmin, Truro, Falmouth, and Newquay.

26. Brown Rat. *Mus decumanus*, Pallas.

Common and generally distributed. Pied varieties are not uncommon, and an albino was killed by Mr. Henry Harris near Stratton in 1901.

27. Black Rat. *Mus rattus*, Linn.

As late as 1850 this rat was not uncommon about Falmouth, and was of frequent occurrence at Hayle and Penzance. At Looe it persisted till the early seventies. In August, 1878, Mr. T. Cornish killed a black rat at Prussia Cove which, from his description, may have been *Mus alexandrinus*. Several were seen and two killed on the Gull Rock, Portscatho, in 1882. About 1880 a small colony existed at a farm called Trenuggo, about four miles west of Penzance, but when Cornish went there in 1883 he failed to secure a specimen, and concluded they had deserted the spot. In 1885 two were killed about a week apart at Newquay. In 1889 Cornish recorded in the *Zoologist* the capture of a black rat at Tredorwin, about five miles north-east of Penzance, and of another at Paul, three miles to the south-west. He also mentions that one had been seen that year at Camborne. In 1891 one was killed near Falmouth by a farm lad, and was seen by the writer when it was in an advanced state of decomposition. There appears to be no further county record till 1902, when one was caught in a trap and another seen at Heamoor, about two miles north-west of Penzance. A fine female specimen of *Mus alexandrinus* was killed in Falmouth Docks on 30 June, 1900.

28. House Mouse, *Mus musculus*, Linn.

Abundant.

29. Long-tailed Field Mouse. *Mus sylvaticus*, Linn.

Abundant almost everywhere. This was the only mouse that appeared in the two 'ladders' of the butcher bird that have recently been found near Truro. One of the birds caught and impaled three of these mice on a stunted white-thorn between four o'clock one afternoon and ten the following morning. During the time these 'ladders' were in use eleven long-tailed field mice appeared in one of them and ten in the other.

A HISTORY OF CORNWALL

30. Harvest Mouse. *Mus minutus*, Pallas.

The diminutive size of this mouse causes it to be generally overlooked, and in consequence its distribution in the county has not yet been worked out. It is locally not uncommon about Penzance, and has been taken at Hayle; about Truro and Falmouth it is local, but on the whole common. It has been captured on East Pentire, Newquay, at Bodmin, at St. Neot, and at Launceston.

31. Water Vole. *Microtus amphibius*, Linn.

Bell—*Arvicola amphibius*.

Common in almost all suitable habitats throughout the county.

32. Field Vole. *Microtus agrestis*, Linn.

Bell—*Arvicola agrestis*.

Abundant, especially in low-lying moist grass-land.

33. Bank Vole. *Evotomys glareolus*, Schreber.

Bell—*Arvicola glareolus*.

This vole does not appear to be plentiful anywhere in the county, but occurs sparingly near Constantine and about Budock, Falmouth, at Pencalenick, and was once taken about five years ago just beyond the Viaduct towards Idless, Truro. One was killed in the Restormel Valley in May, 1901, and it has been recorded from between Altarnun and Launceston, from near Liskeard and from Trerice, Newquay. As old ivy-covered Cornish hedgebanks form an ideal habitat for this vole, it is probable that it is generally distributed throughout the county.

34. Common Hare. *Lepus europaeus*, Pallas.

Bell—*Lepus timidus*.

Formerly common over the greater part of Cornwall, but now locally somewhat scarce in the southern half of the county.

35. Rabbit. *Lepus cuniculus*, Linn.

Abundant almost everywhere.

UNGULATA

[Red Deer. *Cervus elaphus*, Linn.]

Within modern times there have been no resident wild red deer in the county, but the following account of a stray stag from Devonshire by Mr. W. T. Hancock in *The Journal of the Royal Institution of Cornwall*, vii, is of considerable interest: 'Since August, 1879, a wild red stag with a huge pair of horns has been seen in the Hendergrove and Trengall woods, but has eluded all efforts to capture him. When chased he invariably took the hedge. Some three months since he strayed to North Hill, and thence to Sibblyback, where he fed and ran with the colts.'

As the fallow deer in the county are scarcely in a semi-feral condition, *Cervus dama* cannot be claimed as one of the Cornish mammals.]

CETACEA

36. Common Rorqual. *Balaenoptera musculus*, Linn.

Specimens of whales are occasionally seen off the Cornish coast, and are usually referred to this species. Couch says: 'Specimens of the Razorback are seen every year feeding upon the smaller gregarious fishes.' In 1831 a specimen was washed ashore at Plymouth that had been noticed off the Cornish coast for some time previous. In 1850 Mr. Hamilton James saw a baby rorqual 14 ft. long, 7 ft. 8 in. in girth, and weighing just a ton, that had been captured at Polperro. In

1863 a specimen was cast up near the breakwater at Falmouth, the skeleton of which was sent to the Alexandra Palace, Muswell Hill. In 1875 one was found dead about nine miles from land and towed into a cove west of Mevagissey. It was 62 ft. in length and 36 ft. in girth, the tail was 13½ ft. broad and the pectoral fin 8½ ft., the jaws 15 ft. in length and furnished with 350 plates of whalebone on each side. In October, 1880, after an unusually violent storm, a humerus 20 in. long, 39 in. in greatest circumference, and weighing 53 lb. was found on the beach at Port Holland. In May, 1843, a very large specimen was towed ashore at Newquay.

There is, of course, the risk that in one or two of the above records the identification was assumed rather than determined.

37. Sibbald's Rorqual. *Balaenoptera sibbaldi*, Bell.

Dr. Bullmore records one washed ashore at Cadgwith, near the Lizard, 65 ft. in length, 24 ft. in circumference, with a caudal fin 13 ft. broad.

38. Beaked Whale. *Hyperoodon rostrata*, Chem.

Dr. Bullmore records one which was brought into Polperro by the mackerel boats in May, 1850.

[Sperm Whale. *Physeter macrocephalus*, Linn.]

Couch says that a whale, supposed to be of this species, is sometimes seen off the Cornish coasts sailing rapidly along at a uniform elevation in the water with its slender but elevated fin above surface and its body concealed below.]

[Humped Blower. *Physeter polycyphus*, Jen.]

Of this form Couch says: 'One specimen ran itself ashore in pursuit of small fish several years since, and another was seen and minutely described to me by an intelligent fisherman.'

39. Grampus. *Orca gladiator*, Lacépède.

Frequently seen and occasionally captured along the south coast; has been recorded from Padstow.

40. Risso's Grampus. *Grampus griseus*, Cuv.

A beautiful adult female 10 ft. 6 in. long, was caught in the mackerel nets off the Eddystone, 28 February, 1870, and is now in the British Museum.

41. Pilot or Ca'ing Whale. *Globicephalus melas*, Traill.

One was brought into Plymouth in April, 1839, and Matthias Dunn identified one that came ashore near Gorran in or about 1874.

42. Porpoise. *Phocaena communis*, Cuvier.

This, the sniffer of the Cornish fisherman, is common along the south coast, and frequently recorded from the north. It is sometimes caught in drift nets, and occasionally takes bait. It now and then passes up the tidal rivers to a considerable distance, and one 6 ft. long and 122 lb. in weight was found dead on mud at Newham Cove, just below Lostwithiel Moors, in February, 1903.

43. Dolphin. *Delphinus delphis*, Linn.

This is not uncommon along the south coast, and large shoals now and then visit Mount's Bay in summer. It is often observed in Falmouth Harbour. In October, 1891, one 6 feet long was washed ashore in a dying condition near Falmouth Hotel. It has been recorded from St. Ives Bay and off Newquay.



PREHISTORIC MAP

of

CORNWALL.

Scale of Miles

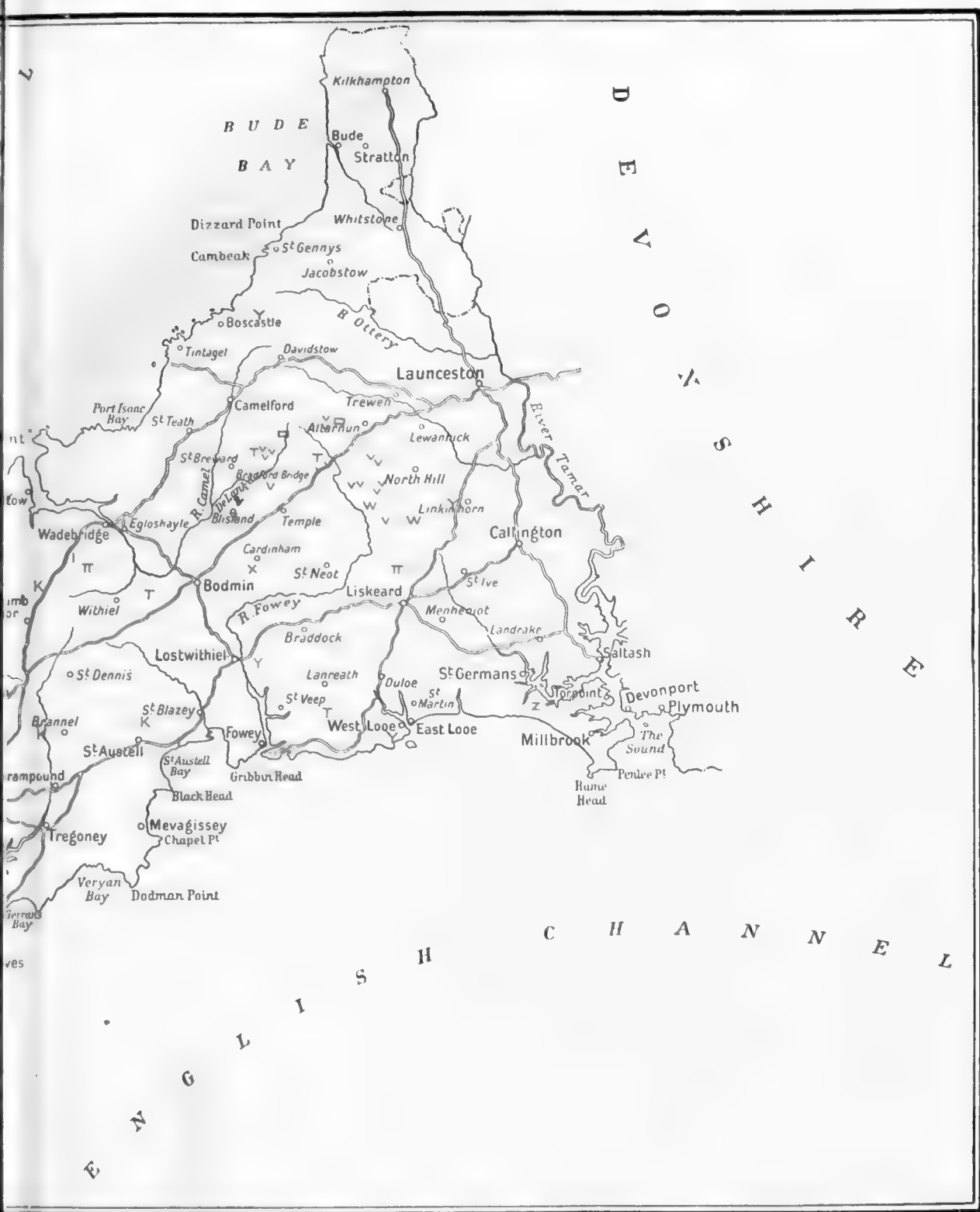


Reference

- T Stone Implements.
- X Bronze Implements.
- Y Gold Ornaments
- ⊙ Chambered Barrows.
- π Quoits.
- Z Contracted Burials.
- Underground Chambers.
- ∇ Hut Circles.
- W Hut Clusters.
- △ Beehive Huts.
- K Early iron Ornaments.
- I Longstones.
- H Holed Stones.

Note. The Barrows and Tumuli are so numerous in Cornwall that it has been found impossible to mark their sites on this map.





EARLY MAN

THE period which the present article is intended to cover extends from the very first appearance of man until the period when written history begins, however feebly, to illuminate the subject.

The materials from which this very early part of the story of man in Cornwall may be built up consist, of course, not of inscriptions or documents, but of crude and often fragmentary traces of man's handiwork in pottery or stone, or metallic objects such as weapons, tools, etc.

The stone circles, of which there are a large number in the county, although properly coming within this classification, have been thought to be of sufficient importance to be dealt with in a special chapter.

Prehistoric antiquities of the character here dealt with, although by no means rare in Cornwall, are perhaps somewhat more restricted in range than we find in the case of more eastern or midland districts in England. In certain classes of prehistoric remains, however, Cornwall is remarkably well-represented, as will be shown in the following pages.

Following the usual classification of prehistoric antiquities adopted in the *Victoria History of the Counties of England*, the following main divisions will be made in this article, although the first of these is but imperfectly represented, viz., Palaeolithic Age, Neolithic Age, Bronze Age, and Early Iron Age.

THE PALAEOLITHIC AGE

It has generally been supposed that Cornwall has not hitherto yielded any palaeolithic antiquities, either in the form of river-drift implements, or of those cave implements of which the adjoining county, Devonshire, has furnished so many famous examples. Recent discoveries at Prah Sands, however, have been made by Mr. and Mrs. Clement Reid, in which an ancient land-surface, certain rude implements (?) of vein-quartz, and traces of fire, and perhaps of hearths, were detected, all of them, it was suggested by the discoverers, being probably of Palaeolithic Age.¹ Whatever the final verdict may be as to the definite age of this land-surface after further observations may have made it possible to arrive at a clear idea as to its character, there can be little if any doubt as to the fact that this is really an ancient land-surface, certainly as old as the neolithic period. It comes well within the scope of prehistoric archaeology, but in order to prevent any possible misunderstanding it has been considered wiser to include a description of it in the neolithic section rather than in the palaeolithic section.

THE NEOLITHIC AGE

The antiquities found in Cornwall furnish abundant evidence of early man during this period. These consist of the actual remains of human beings discovered in interments, as well as the implements and weapons made

¹ *Quart. Journ. Geol. Soc.* lx, 106-110. Feb. 1904.

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by man ; and also, in the case of the ancient floor at Prah Sands first referred to, the actual sites of fires, etc., made probably by neolithic men.

It will be convenient, perhaps, to deal with the last-mentioned discovery first. In the years 1902 and 1903, during some severe gales, much of the talus and sand which masked the foot of the cliff between Sydney Cove and Hoe Point, at Prah Sands, was washed away. The beach was removed in several places, so as to show the rocky floor beneath. In this way the ancient floor was laid bare at the foot of the cliffs. It occurred as a black seam about six inches thick, consisting largely of small fragments of charcoal, mixed with small splinters of carbonized bone, and fragments of burnt earth. On carefully examining this black layer Mr. Clement Reid¹ ascertained that this charcoal was particularly abundant at several spots where the loam, as a rule nearly clean, contained groups of three or four blocks of flattish slabs of stone, which were generally of elvan. At these spots the black loam was commonly full of pieces of quartz, usually small, possibly the remains of larger blocks shattered by fire. 'As we had evidently found a true land-surface,' writes Mr. Reid, 'on which man had made hearths and lighted fires, a careful search was made in this black layer. Unfortunately the deposit seems to have been thoroughly decalcified, and the fossils destroyed by percolating water, for only carbonized remains are preserved. We found, however, some of the larger pieces of vein-quartz in this layer were apparently fashioned into rude implements ; but these had been battered into shape, not flaked. This absence of flaking seems, however, to be due to the intractable nature of the only material available. Vein-quartz breaks with a rough, splintery fracture, for each lump is usually made up of portions of many crystals, and the material will not flake like chalk-flint or like large crystals of quartz. . . . The quantity of charcoal observed, and the number of hearths found (six or seven) were surprising ; but this bay must have been a particularly favourable locality for observation. It faces south, is sheltered by high land, and behind the terrace of raised beach the old sea-cliff in all probability furnished many dry caves suitable for dwellings. Within a few yards was also a stream of fresh water.'

As far as the 'implements' are concerned, it must be confessed that a careful examination hardly tends to confirm the theory that their shape is due to human agency. They are so irregular in form, and composed of a material of such an unserviceable character for cutting or piercing, that, for the present at any rate, and until some further evidence is produced, it seems wiser to regard them as naturally shaped blocks of stone. The discovery of roughly constructed hearths and associated charcoal would point, however, to the presence of man.

Cornwall has furnished numerous neolithic antiquities, in addition to sepulchral deposits, stone circles, and remains of dwellings, which will be dealt with in the present paper. Flakes of flint, of the regular neolithic types, have been found in some abundance in different parts of the county, but flint is by no means the only material employed, greenstone, jadeite, serpentine, aphanite (a species of hornblende rock), and even granite, having been used in the manufacture of celts, axe-heads, and other articles. Some of the objects made of stone, however, such as the perforated axe found in association with a bronze dagger at Pelynt, and a whetstone found with urns

¹ *Quart. Journ. Geol. Soc.* lx, 108. The spot has since been covered by a landslide.



BRONZE IMPLEMENTS.

1. Socketed Knife from Lelant.

2. Ferrule from Lelant.

3. Saw from Mawgan.

EARLY MAN

at Brane Common, belong perhaps to the Bronze Age rather than the Neolithic. The scraper, flint knife, lance-heads, and arrow-heads found at Carn Brea, as well as the rough celts of greenstone from St. Just, and now in Truro Museum, are probably of genuinely Neolithic Age. The minor objects which call for no special remark will be found mentioned in the topographical list of prehistoric antiquities at the end of this article.

THE BRONZE AGE

The abundance of both copper and tin in Cornwall, and the evidence showing that the latter of these metals was worked at a very early period, might naturally lead one to expect to find many remains of early bronze implements and weapons within the county. As a matter of fact, several examples of these interesting antiquities have been found, and if they are perhaps rather less in numbers than one might anticipate, they are of very great interest for other reasons, particularly on account of their association with personal ornaments of gold, and enriched with purely Bronze-Age forms of ornamentation.

Of the bronze antiquities those in the form of hoards, and consisting of several articles placed together, should perhaps first be mentioned. Cornwall has yielded six¹ of these hoards, of which the following are brief details:—

1. Kenidjack Cliff² (St. Just-in-Penwith).—During the construction of the butts for rifle practice here, some stones set on edge (probably the remains of an ancient building) had to be removed, and below them were found two socketed and looped celts, a palstave much broken towards the cutting end, an oval piece of bronze, probably a 'jet,' resulting from casting a bronze article, from twenty to thirty pieces of pure copper, and a single fragment of well-baked pottery. The purity of the lumps of copper points to this hoard having been the property of a founder of bronze tools or weapons.

2. Lelant.³—This hoard was discovered by a farmer. Two feet below the surface he found amongst ashes many celts both perfect and broken. In the bottom of one of the largest and most perfect of the celts were some small bars of gold about the size of a straw. The hoard also contained a socketed knife, a bronze ferrule, and a very symmetrical jet of metal, circular in form, with four irregularly-conical runners proceeding from it. These three last-named objects, which are now preserved in the rooms of the Society of Antiquaries of London, are shown in the accompanying illustrations.

3. Mawgan.⁴—At a depth of 12 ft. under a bed of black mud were found a fine rapier of bronze in excellent preservation, a rude bronze saw, also of bronze, and socketed celts and a palstave.

4. St. Hilary.⁵—The most remarkable feature of this hoard, which contained celts and spear-heads, was a number of lumps of bronze weighing 14 or 15 lb. a piece, the total weight of the hoard being 80 lb.

5. Carn Brea.⁶—'In the year 1744 in the side of Karn Brê Hill were dug up several hollow instruments of brass of different sizes, called celts.'

¹ Leland (1530) wrote: 'There was found of late yeres syns spere heddes, axis for warre and swerdes of copper, wrappid up in lynin scant perished near the Mount in St. Hilaries paroch in tynne works.' This is probably the same find as is mentioned in Camden, 188, and Norden, 37.

² *Journ. Roy. Inst. Cornw.* vi, 191-193.

³ *Arch.* xv, 118. Evans, *Bronze Imp.* 285. *Journ. Roy. Inst. Cornw.* iii (1868), 48; Lysons, ccxx.

⁴ *Arch.* xvii, 337, 338; Lysons, ccxx.

⁵ *Arch.* xv, 120. *Journ. Roy. Inst. Cornw.* iii (1868), 48; Lysons, ccxx.

⁶ Borlase, *Antiq.*, 281; Lysons, ccxx.

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6. At Higher Roseworthy¹ (Camborne) fragments of 40 to 50 socketed celts of bronze were found in a pit about 1 ft. deep covered by a small stone.

The secret burial of collections of metal of this kind points to a primitive condition of the population of Cornwall. The aim was to secure treasure and valuable belongings of this character from depredations of enemies. It has been believed that in order to hide such deposits successfully remote and unfrequented spots were selected, and this doubtless was so; but in the case of the Kenidjack Cliff hoard it seems possible that the bronze valuables were buried for safety under or near a stone-built dwelling. Apart from hoards such as the foregoing, some bronze weapons have been discovered from time to time. There are records of a dagger or small sword 16 in. long, which was found with a palstave at Benallack, near Par;² a smaller dagger, 8½ in. long, found in tin stream-works at St. Ewe;³ a fine spear-head and a small chisel at Pentuan;⁴ a double-looped palstave of very rare type found at Penvores, in the parish of Mawgan-in-Meneage;⁵ and isolated celts at Altarnun,⁶ Carn Brea,⁷ Launceston,⁸ St. Merryn,⁹ and Penzance,¹⁰ and some of these were found in company with Roman coins.¹¹

Although it has generally been believed that the presence of copper in Cornwall was not known at such an early period, the discovery of a stone with a depression made in the surface, which might have been a mould for casting celts, in company with a small hollowed basin of greenstone, in a field below the vicarage of Altarnun,¹² and of a stone mould for casting buckles at Camelford,¹³ render it possible that some of the bronze implements may have been actually made in the county.

The gold ornaments found in Cornwall are of the greatest archaeological interest, and deserve careful study. They comprise no less than four examples of those crescent-shaped plates to which the terms lunette, diadem, and gorget have at various times and by different writers been applied. Their general forms and their decorative details will be understood from the accompanying figures.

One beautiful Cornish example was found near Penzance, and is now in the British Museum. It was figured by Lysons in *Magna Britannia*¹⁴ in 1813 or 1814, and the engraving shows very clearly the definite Bronze-Age type of ornamental forms used. These consist of lozenges, triangles, zig-zags, etc., and the only curves introduced are those formed by the ornament following the outline of the gorget.

A second example on record is said to have been found in the parish of St. Juliot, but unfortunately it is not known where it is at present. It was seen many years ago by Mr. Albert Way, from whom an outline drawing was obtained by Mr. Edward Smirke.¹⁵

Two other gold lunulae and a bronze celt of early type were found on the estate at Harlyn, in the parish of Padstow, before the year 1865. The objects were claimed as treasure-trove by the Duchy of Cornwall, and were

¹ *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1880-1), 74.

² Borlase, *Naen. Corn.* 5.

³ Borlase, *Antiq. of Cornw.* 311.

⁵ Evans, *Bronze Imp.* 95.

⁶ *Journ. Roy. Inst. Cornw.* (1888), 350.

⁸ Evans, *Bronze Imp.* 119.

¹⁰ Evans, *Bronze Imp.* 81.

¹² *Journ. Roy. Inst. Cornw.* (1849), 57.

¹⁴ Vol. iii, plate opposite page ccxxi.

⁴ *Trans. Penz. Nat. Hist. and Antiq. Soc.* ii, 88; now in museum.

⁷ Borlase, *Antiq.* 281.

⁹ *Journ. Roy. Inst. Cornw.* ii, 136.

¹¹ Borlase, *Naen. Corn.* 5.

¹³ Evans, *Bronze Imp.* 438.

¹⁵ *Journ. Roy. Inst. Cornw.* ii, 135.

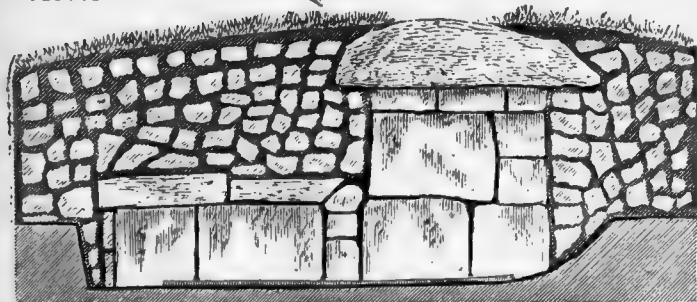


GOLDEN GORGET FOUND NEAR PENZANCE.



BRONZE CELT FROM HARLYN, PADSTOW.

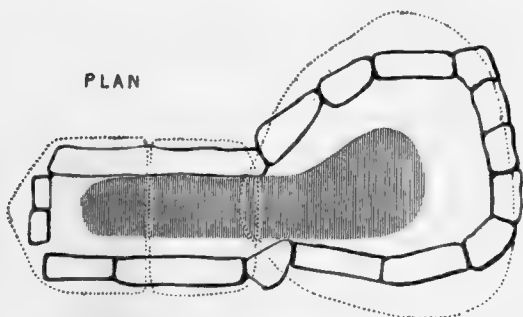
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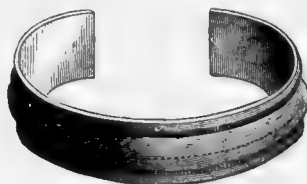
GRAVE AND CHAMBER IN CAIRN AT TREGIFFIAN.

PLAN

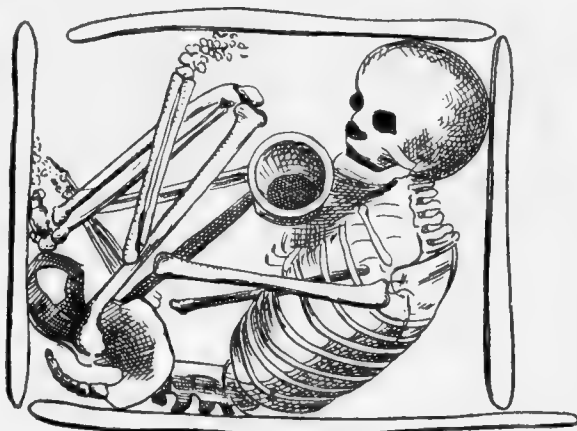


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GRAVE AND CHAMBER IN CAIRN AT TREGIFFIAN.



BRONZE ARMLET.



KISTVAEN WITH CONTRACTED BURIAL, TRETHILL.

EARLY MAN

purchased by the Royal Institution of Cornwall and are now in the Museum at Truro. They have been described and figured in the *Journal*¹ published by that institution.

It is hardly necessary to dwell upon the extraordinary value and archaeological interest of these four specimens of gold ornaments. There is no reasonable doubt now that they were worn on the throat or breast as objects of personal adornment, and were not ornaments for the head as the term diadem would suggest. Whilst met with in some numbers in Ireland, gorgets of this character are very rarely found in England, and are still rarer on the continent of Europe. It is probable that they were all made in Ireland and distributed by the means of commercial intercourse amongst the various countries where they have been found.

Another extremely important discovery which may be noted at this point was the gold cup found in a barrow at Rillaton in association with a bronze dagger.² The cup is $3\frac{1}{4}$ inches high. In a general form it follows pretty closely the shape of a typical earthen drinking-cup of the Bronze Age, and there is no doubt that it is to that period that it may be assigned. The bottom is of small diameter, and the sides in the lower part of the cup swell out to rather more than twice that diameter. Above this there is a slight contraction, which produces a species of waist: the mouth again expands slightly until it reaches a diameter of $3\frac{1}{4}$ inches, just the height of the cup. Thirteen raised bands run horizontally round the sides, and four concentric circles are placed round a small conical boss on the bottom. The relative size, position, and ornamentation of the handle are all suggestive of the amber cup found in a Bronze-Age barrow at Hove, Sussex.

This gold cup at Rillaton was found in association with a bronze dagger (it has been erroneously called a celt). This circumstance, and the general similarity of form to typical Bronze-Age cups in clay, make it pretty clear that the gold cup is a relic of the Bronze Age.

The following objects in gold have also been found in Cornwall :—

Six armlets found at Carne in Morvah, and now in the British Museum.
Part of a plain armlet³ found at Tredinney in Sancreed in 1864, and now in the Museum at Penzance.

Part of an armlet (or ? brooch)⁴ found near the Lizard in 1824, now in the British Museum.

A chain about 18 inches long found at West Looe Down, in Talland, about 1806⁵ and now lost.

In addition to these some 'gold ornaments' appear to have been found in St. Winnow,⁶ but no particulars are recorded, and there is a statement in *The Barrow Diggers* (1839, p. 72) that a gold celt had been found in Cornwall, but it is of doubtful accuracy.

BARROWS

The difficulty of classifying the pre-historic sepulchral remains of Cornwall, and of differentiating burials of the Stone Age from those of the

¹ *Journ. Roy. Inst. Cornw.* ii, plate opposite page 142.

² *Ibid.* iii, 34 and plate 48.

³ *Trans. Penz. Nat. and Antiq. Soc.* (1862-5), 38; *Journ. Roy. Inst. Cornw.* iii, 46.

⁴ *Journ. Roy. Inst. Cornw.* iii, 47.

⁵ Gilbert, *Parochial Hist. of Cornw.* iv, 33.

⁶ *Journ. Roy. Inst. Cornw.* ii (1866), xx.

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Bronze Age or later periods, was pointed out by Mr. W. C. Borlase, F.S.A., in *Naenia Cornubiae*. It is an undoubted fact that the barrows and other sepulchral deposits of Cornwall present features which, compared with those in other parts of the kingdom, may be regarded as abnormal, but the character of the objects contained in or accompanying them is sufficiently well-pronounced to indicate the relative positions to which the burials may be assigned.

The following particulars of Cornish barrows include those both of the Stone Age and of the Bronze Age, and as it is not possible in every case to differentiate them it has been deemed best to treat them together under the general head of barrows :—

Although many barrows have been removed from time to time for the purpose of agricultural improvements, there still remains a very large number on the hills, the moors, and the cliffs throughout Cornwall. The author of *Naenia Cornubiae* mentions that five kinds of barrows, known respectively as the cone-shaped barrow, the bowl barrow, the bell barrow, the flat barrow, and the ring barrow, are found. But these distinctions are perhaps little more than differences in height, the Cornish barrows varying in height almost as much as in diameter. The dimensions range from 18 in. in height¹ and 9 ft. diameter,² to 28 ft. in height and 116 ft. in diameter.³ It seems probable that these differences are due to the amount of time and material which the builders had for the work rather than to any deliberate plan of construction. If they be arranged according to their contents they show two marked classes, viz., (a) the chambered barrow, which is sometimes long⁴ and sometimes round;⁵ and (b) the more usual round barrow, containing one or more small kist vaens or urns. The distinction between these two types is very noticeable, and as at Chapel Carn Brea⁶ a kist vaen was found in the mound covering a chambered barrow, it is just possible that the one may be of an earlier date than the other.

In the round chambered-barrows the chamber is nearly square, while in the long specimens it is oblong. In every case it occupies the greater portion of the whole bulk of the mound; the sides and one end are built of stone, and the roof composed of long stones laid across, and the whole covered by a mound. In one of the 'Giants Caves' at Scilly⁷ the chamber was 22 ft. long, 4 ft. 8 in. wide, and 4 ft. 10 in. high; and in the other 14 ft. long, 2 ft. high, and 4 ft. wide in the middle; while that of the Pennance⁸ barrow is 9 ft. 6 in. in length, 4 ft. in width, and 4 ft. 4 in. in height. The

¹ Botrea Hill, Sancreed, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 234; Edmonds, *The Land's End District*, 33; Borlase, *Naen. Corn.* 134.

² Trannack, Madron, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 234; Edmonds, op. cit. 32; Borlase, *Naen. Corn.* 208.

³ Veryan Beacon, *Journ. Roy. Inst. Cornw.* (1855), 23; Drew, *Hist. of Cornw.* ii, 289 and 664; Borlase, *Naen. Corn.* 204.

⁴ Scilly, Borlase, *Observations*, 30; Borlase, *Naen. Corn.* 72; Pennance, *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1862-5), 44; Ibid. (1883-4), 310; *Gent. Mag.* 1865 (and plan); Borlase, *Naen. Corn.* 74; Tregiffian, *Journ. Roy. Inst. Cornw.* (1879), 211 (and plan).

⁵ Treen in Zennor, Borlase, *Naen. Corn.* 73; Brane, Sancreed (as Chapel Euny), *Journ. Roy. Inst. Cornw.* (1865), 19 (and plan); Borlase, *Naen. Corn.* 75 (fig. and plan).

⁶ Borlase, *The Age of the Saints*, Introd. viii.

⁷ Scilly, Borlase, *Observations*, 30.

⁸ Pennance, *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1862-5), 44; Ibid. (1883-4), 310.

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others are shorter than these, but much the same in other dimensions. The barrows on the Isles of Scilly are generally of this kind,¹ but only five are now known in Cornwall, and they are all in the extreme western extremity beyond Penzance. Most of those on the islands have been rifled by irresponsible people, and of the Cornish specimens three, viz., Pennance, Treen,² and Brane,³ have been opened longer than any records and used as shelters for calves. At Tregiffian,⁴ which is curious for its irregular shape and in being more in the nature of two chambers, one higher than the other, opening into one another, Mr. W. C. Borlase found in 1879 on the floor, under the stones and earth of which the chamber was full, a stratum of human bone mixed with the ashes of a peat fire, and everywhere indications of great heat; and at Tregeseal⁵ were the bases of three urns, a large quantity of burnt human bones, a whetstone with a hole in it, and at the back of the chamber, standing in a little stone kist, the largest sepulchral urn ever found in Cornwall. The urn, which was nearly 2 ft. high, was, as is so often the case in barrows of the other type, standing mouth downwards. At Kerris⁶ was found a small urn of finest red clay, which Dr. Borlase thought to be Roman.

The rest of the Cornish barrows are of the other kind referred to. They are round, and some of them are built up around a natural carn or projecting rock and surrounded by a single ring of stones,⁷ while in others the mound is entirely artificial and surrounded at the base by a circle of flat stones set on edge.⁸ It is probable that many which are now without this protection originally possessed it, the stones having been removed for hedging or other purposes, as sometimes traces of some such foundation are still to be seen.⁹ In some cases the barrow contains one¹⁰ or two,¹¹ and in one instance four¹² concentric stone walls buried under the material of which the whole is composed.

Most of the barrows still existing are to be found on the hill sides and higher moorlands, but this may be due to the fact that those which perhaps

¹ *Journ. Roy. Inst. Cornw.* 48th Report, 1863, 50.

² Borlase, *Naen. Corn.* 73.

³ *Journ. Roy. Inst. Cornw.* i (1865), 19.

⁴ *Ibid.* (1879), 11.

⁵ In St. Just, *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1880-1), 19.

⁶ Dr. Borlase, *Antiq.* 307, mentions that in 1723 in removing an old hedge the workmen discovered 'a vault about 8 feet long and 6 feet high, the floor paved with stone, and the roof arched over with the same materials.' Unless his informant was mistaken this is unique in Cornwall, and cannot be classed with any other of the monuments.

⁷ Trewavas Head, *Journ. Roy. Inst. Cornw.* (1867), 306; Borlase, *Naen. Corn.* 140; Tredinney, Borlase, *Naen. Corn.* 232; Trescow in Breage, Borlase, *Antiq.* 200; Carmenelez, Wendron, Borlase, *Antiq.* 200, 308; Boscawen Un, Borlase, *Naen. Corn.* 219.

⁸ Clahar Garden Mullion, Borlase, *Naen. Corn.* 224; Pradanack, Borlase, *Naen. Corn.* 240; Morvah Hill, Borlase, *Naen. Corn.* 249; Pelynt, Borlase, *Naen. Corn.* 191; Hustyn, *Journ. Roy. Inst. Cornw.* vii, 144. The circle at Duloe, where an urn was found, may have been the base of a barrow of this description, Borlase, *Naen. Corn.* 127.

⁹ Goonornan Downs, Borlase, *Naen. Corn.* 133; Boscreggan, *Journ. Roy. Inst. Cornw.* (1879), vi, 204; Durval, Borlase, *Naen. Corn.* 172.

¹⁰ Bosporthenis, Borlase, *Naen. Corn.* 284; Lanyon, *Ibid.* 154; Hustyn, *Journ. Roy. Inst. Cornw.* vii, 144.

¹¹ Ballowal, *Journ. Roy. Inst. Cornw.* vi (1879), 194; Bodinnar, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 235; Bosavern, Borlase, *Antiq.* 235; Bosporthenis, Borlase, *Naen. Corn.* 284; Boleigh, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 229.

¹² *Journ. Roy. Inst. Cornw.* 22nd Ann. Rep. (1840), 39 and section. Mr. Millett describes this barrow as being on Carn Gollewa (Galver), but there is no such thing on that hill; it is presumed that he meant the north eastern barrow on the adjoining (Morvah) Hill. This is composed entirely of loose stones. It is difficult to discover four walls there now.

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were on the lower grounds have been destroyed. A few occupy prominent places on the headlands¹ and one² stands conspicuous on the exact crest of a hill.

In some parts of the county considerable numbers are grouped together within a comparatively small area,³ suggesting a contemporary origin, and in others⁴ there seems to be a possibility of methodical arrangement. Not only have a very large number been carelessly rifled and their contents destroyed, but even in many cases where a proper examination has been made the records are unfortunately incomplete in many important details, but it is certain that in the greatest number the barrow contained within its area, not necessarily in the centre,⁵ a kist vaen, usually of small size, measuring about 2 ft. or 3 ft. each way, but in some cases large enough to take a human body.⁶ The smaller of these kists are made of four flat stones for sides, and one for a cover, and generally, but not always, one for a floor; but in some cases the sides are built of small stones.⁷ Sometimes a pit has been sunk into the natural ground over which the barrow has been raised. At Glendorgal, Tresawsen, and Fowey, the pit was lined with flat stones.⁸ At Bosporthennis in Zennor⁹ two urns, and at Tredinney in St. Just¹⁰ one, were found with no kist vaen or pit, but with small stones carefully packed in round them and otherwise unprotected.

Whether there is a kist vaen or a pit, or not, in almost every case the barrow has been found to contain traces of cremation in the form of burnt bones or a black greasy mould, and as frequently one or more burial urns, rudely made, of local materials, generally with some slight zigzag ornament, and often with handles, containing calcined human bones.

Several specimens of these urns are to be seen in the museums of the Royal Institution of Cornwall at Truro and the Natural History and Antiquarian Society at Penzance, but unfortunately a large number have been allowed to pass into private collections.

¹ Trevalga in St. Columb Minor, Borlase, *Naen. Corn.* 80; Trewavas, *Journ. Roy. Inst. Cornw.* (1867), 306; Ballowal, *Journ. Roy. Inst. Cornw.* vi (1879), 194.

² Chapel Carn Brea, Borlase, *Age of the Saints*, Introd. viii.

³ Carland in St. Erme, Pelynt, *Journ. Roy. Inst. Cornw.* (1845), 34; (1846), 43; Gwallon Downs, St. Austell, Borlase, *Naen. Corn.* 185; Trewortha, *Journ. Roy. Inst. Cornw.* xi, 290.

⁴ Botrea, Sancreed, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 234; Edmonds, *The Land's End District*, 33; Borlase, *Naen. Corn.* 134; Durval, Sancreed, Borlase, *Naen. Corn.* 171; Denzell Downs, St. Columb Major, Borlase, *Naen. Corn.* 243; Tichbarrow Beacon Lesnewth, Maclean, *Parochial Hist.* ii, 400.

⁵ Denzell Downs, Borlase, *Naen. Corn.* 243; Trevalga, Borlase, *Naen. Corn.* 80; Newquay, *Journ. Roy. Inst. Cornw.* (1840) 61; *Naen. Corn.* 197; Trewortha, *Journ. Roy. Inst. Cornw.* xi, 290; Gwallon Downs, Borlase, *Naen. Corn.* 185; Gunwalloe, *Journ. Roy. Inst. Cornw.* xiii, 438.

⁶ Boscawen Un, *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1862), 10; Trevalga, Borlase, *Naen. Corn.* 80; Rillaton, Linkinhorne, *Journ. Roy. Inst. Cornw.* ii (1868), 34; Bosporthennis, Borlase, *Naen. Corn.* 66; *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1862), 43.

⁷ St. Austell Downs, Borlase, *Naen. Corn.* 153; Gwithian, Borlase, *Antiq.* 236; Borlase, *Naen. Corn.* 170; Pelynt, *Journ. Roy. Inst. Cornw.* (1846), 43; Conker Downs, Borlase, *Naen. Corn.* 210, urn now in Penzance Museum. One at Sampson, Scilly, seems to have been made more skilfully and carefully than any in Cornwall. Mr. Smith mentions clay mortar in the joints, and that the end stones were placed between the sides, which were roughly grooved to receive them; *Journ. Roy. Inst. Cornw.* (1863), 50; Borlase, *Naen. Corn.* 159.

⁸ Cardinham, *Journ. Roy. Inst. Cornw.* (1875), 214; Glendorgal, *Journ. Roy. Inst. Cornw.* (1850), 56; Borlase, *Naen. Corn.* 199; Fowey, *Journ. Roy. Inst. Cornw.* (1840), 65; Borlase, *Naen. Corn.* 202, urn now in Truro Museum; Angrowse, *Naen. Corn.* 237; Gerrans, *Naen. Corn.* 204, urn now in Truro Museum; Trevelloe, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 231; Edmonds, op. cit. 31; Borlase, *Naen. Corn.* 207, two urns now in Penzance Museum; Pelynt, *Journ. Roy. Inst. Cornw.* (1846), 43; Harlyn, *Journ. Roy. Inst. Cornw.* x (1890), 199; Tresawsen in Merther, urn now in Truro Museum; Treworricks, near Mevagissey, urn now in Truro Museum.

⁹ Borlase, *Naen. Corn.* 286.

¹⁰ Ibid. 232.

Level

SECTION OF BARROW ON LINE ABGHKLMNO

GRAVE

Part concealed under rubbish

SCALE OF FEET
0 2 4 6 8 10 12 14 16 18 20

Line of Section

Ground falls.

GRAVE

GRAVE

Line or inside base of inner dome

Outside base of inner dome

Outside base

True N. North

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In most instances only one urn with or without a protecting kist is found in each barrow,¹ but two were found in one barrow at Trelowarren,² Trevelloe,³ Bosporthenis⁴ and Boscawen Un,⁵ three at Clahar Garden⁶ and Gunwalloe.⁷ Four kist vaens were found in one barrow at Bodinnar;⁸ one complete urn and the remains of three others in the chambered barrow at Tregeseal; five urns in the round barrow at Bosavern,⁹ five or six at Trannack,¹⁰ and no less than seven in a similar monument at Boscreggan.¹¹ In the barrow at Ballowal in St. Just,¹² which is the most interesting though not the largest in Cornwall, were found, in addition to a grave sunk in the natural ground, nine kist vaens, six of these being within the inner circular wall, but apparently only two of these contained urns. Dr. Borlase¹³ records a story of a barrow at Chikarn in St. Just in which were found in 1733 'about fifty urns,' but unfortunately the barrow was removed and all the urns save one destroyed before he heard of the discovery. A little earthenware cup 1½ in. high was found with a large urn in a kist vaen, exposed by the washing away of the cliff, at Harlyn Bay.¹⁴

At Trannack¹⁵ and Boscreggan¹⁶ two urns were found one inside the other, and this also seems to have been the case at Boscawen Un.¹⁷ It is usual to find the urn in the kist vaen, but at Nanstallon,¹⁸ Breock Downs,¹⁹ Denzell Downs,²⁰ Newquay,²¹ Trannack²² and Pelynt,²³ urns have been found with no kist or protection at all, while at Trelowarren²⁴ and Escalls,²⁵ although in each

¹ Gwallon Downs, Borlase, *Naen. Corn.* 185, fragments now in Truro Museum; Boleigh, St. Burian, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 229; Boleit, Borlase, *Naen. Corn.* 217; St. Cleer, *Phym. Inst.* x (1888), 244; Denzell Downs, Borlase, *Naen. Corn.* 243, fragments now in Truro Museum; Newquay, *Journ. Roy. Inst. Cornw.* (1840), 61, fragments now in Truro Museum; Glendorgal, *Journ. Roy. Inst. Cornw.* (1850), 56, now in Truro Museum; Creed, Drew, *Hist.* ii, 186; Portscatho, Borlase, *Naen. Corn.* 205, fragments in Penzance Museum; Leswidden, Borlase, *Antiq.* 310; Tredinney, Borlase, *Naen. Corn.* 232; St. Minver, Maclean, op. cit. iii, 7; Morvah, Borlase, *Nat. Hist.* 322; Drew, *Hist.* ii, 497; Borlase, *Naen. Corn.* 182; Morvah Hill, Borlase, *Naen. Corn.* 247, fragment now in Truro Museum; Carn Galver, *supra* (359); Angrowse, Borlase, *Naen. Corn.* 234, 237, fragments now in Truro Museum; Pradanack, Borlase, *Naen. Corn.* 240; Pelynt, *Ibid.* 191; Perran Zabuloe, Borlase, *Antiq.* 311; Borlase, *Naen. Corn.* 181; Botrea, Sancreed, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 234; Escalls, *Journ. Roy. Inst. Cornw.* (1879), 209, now in Truro Museum; Maen, Borlase, *Antiq.* 237; Borlase, *Naen. Corn.* 79; Towednack, Borlase, *Antiq.* 300; Borlase, *Naen. Corn.* 268; Conker Downs, *Ibid.* 210; Tywardreath, Carew, *Surv. of Cornw.* 137; Wendron, Borlase, *Antiq.* 307; Withiel Carew, op. cit. 148; Drew, *Hist.* ii, 683; Zennor, *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1883-4), 310; Nanstallon, *Journ. Roy. Inst. Cornw.* x (1890), 196; Hustyn, *Ibid.* vii, 144, fragment now in Truro Museum; Harlyn, *Ibid.* x (1890), 199; Sennen, Borlase, *Naen. Corn.* 230, now in Truro Museum; St. Austell, *Journ. Roy. Inst. Cornw.* (1846), 42.

² Borlase, *Antiq.* 214, 237.

³ *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 231; Edmonds, *The Land's End District*, 31; Borlase, *Naen. Corn.* 207, now in Penzance Museum.

⁴ Borlase, *Naen. Corn.* 286.

⁵ *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1862-5), 11; Borlase, *Naen. Corn.* 219, now in Penzance Museum.

⁶ Borlase, *Naen. Corn.* 223.

⁷ *Journ. Roy. Inst. Cornw.* xiii, 438, now in Truro Museum.

⁸ *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 235.

⁹ Borlase, *Antiq.* 235.

¹⁰ *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 234; Borlase, *Naen. Corn.* 208, two now in Penzance Museum.

¹¹ *Journ. Roy. Inst. Cornw.* vi (1879), 201, fragments of three now in Truro Museum.

¹² *Ibid.* 194, fragment now in Truro Museum.

¹³ Borlase, *Antiq.* 234, fragments of two now in Truro Museum.

¹⁴ *Journ. Roy. Inst. Cornw.* x (1890), 204.

¹⁵ *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 234; Borlase, *Naen. Corn.* 208.

¹⁶ *Journ. Roy. Inst. Cornw.* vi (1879), 201.

¹⁷ Borlase, *Naen. Corn.* 219.

¹⁸ *Journ. Roy. Inst. Cornw.* x (1890), 196.

¹⁹ *Ibid.* iii (1869), xxxiv.

²⁰ Borlase, *Naen. Corn.* 242, 246.

²¹ *Journ. Roy. Inst. Cornw.* (1840), 61; Borlase, *Naen. Corn.* 197.

²² *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 234; Borlase, *Naen. Corn.* 208.

²³ *Journ. Roy. Inst. Cornw.* (1846), 43.

²⁴ Borlase, *Antiq.* 214, 237.

²⁵ *Journ. Roy. Inst. Cornw.* vi (1879), 209, now in Truro Museum.

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case the barrow contained a kist, the urns were found outside it. Sometimes it is recorded that the kist was empty,¹ but this may be an error from want of careful examination, because in several instances² where there was no urn discovered there were burnt bones and evidence of cremation.

Kists have occasionally been discovered,³ and sometimes⁴ containing urns, where there was no barrow at all, but it is most likely that in all these cases the barrow had been removed, while the kist having been originally placed in a sunk pit escaped the destruction. This inference is borne out by the observations made at Ladock and Manaccan,¹ where the surface showed evident traces of having been levelled.

In 1886 two kiln-dried urns, both broken, but one containing bones, were found at some depth below the surface in ground which had been previously broken in Penzance Cemetery.⁵ In 1899 another part of this same ground yielded two copper coins of Vespasian.

In eight cases in Cornwall and one at Scilly the body seems to have been buried in a kist or sunk grave under a barrow without having been burnt, and of these three⁶ are apparently cases of contracted burial; at Bosavern⁷ the body is stated to have lain at full length; at Trevalga,⁸ the Gugh at Scilly,⁹ and Cardinham,⁹ the evidence is slight or the record imperfect. The discovery at Maen in Sennen in 1716 recorded by Dr. Borlase¹⁰ is quoted by the author of *Naenia Cornubiae* as an instance of contracted burial, but admittedly 'a very doubtful' one. The extreme scarcity of this form of burial in the barrows is particularly interesting in comparison with the discoveries at Harlyn Bay and Sheviock.¹¹

Objects of metal are but rarely found in the Cornish barrows. The Rillaton cup, found in 1837 in a barrow near the Cheesewring, is the only article of gold¹² of which there is definite record, and iron is unknown.

At Trelan in St. Keverne in a kist vaen, one of a group of 'several,' were discovered, about 1833, a bronze mirror, two brass rings, gilded, two fragments of bronze fibulae, and some fragments of brass rings and bronze ornaments.¹³ The mirror is now in the British Museum.

Some thin bits of brass (?) which may have been parts of a broken sword were found in a barrow at Trelowarren;¹⁴ a bronze palstave in one near

¹ Ladock, *Journ. Roy. Inst. Cornw.* viii (1884), 211; Ballowall, *Journ. Roy. Inst. Cornw.* vi (1879), 194; Bodinnar, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 235; Manaccan, Drew, *Hist. of Cornw.* i, 378.

² Pelynt, *Journ. Roy. Inst. Cornw.* (1846), 43; Durvall Downs, Borlase, *Naen. Corn.* 171; Veryan Beacon, *Journ. Roy. Inst. Cornw.* (1855), 23; Borlase, *Naen. Corn.* 204; Trewortha, *Journ. Roy. Inst. Cornw.* xi, 290.

³ Ladock, *Journ. Roy. Inst. Cornw.* viii (1884), 211; Gwithian, Borlase, *Antiq.* 236; Borlase, *Naen. Corn.* 170; Trelan in St. Keverne, *Journ. Roy. Inst. Cornw.* iv (1873), 266.

⁴ Gerrans, *Journ. Roy. Inst. Cornw.* (1844), 19; Borlase, *Naen. Corn.* 204; Gwithian, Borlase, *Antiq.* 236; Fowey, *Journ. Roy. Inst. Cornw.* (1840), 65; Borlase, *Naen. Corn.* 202; Sennen, Borlase, *Antiq.* 237; Borlase, *Naen. Corn.* 79; Calartha, *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1883-4), 249; Brance Common, Borlase, *Naen. Corn.* 212, now in Penzance Museum.

⁵ *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1886-7), 293.

⁶ Camelford, *Journ. Roy. Inst. Cornw.* ii (1867), 279; Trevalga, Borlase, *Naen. Corn.* 80; Lesnewth, Borlase, *Naen. Corn.* 79; Maclean, *Parochial Hist.* ii, 400.

⁷ Borlase, *Antiq.* 235.

⁸ Mr. G. Bonsor found part of a human skeleton in a chambered barrow here; from the relative position of some of the bones he inferred a contracted position.

⁹ *Journ. Roy. Inst. Cornw.* iv (1875), 214.

¹⁰ Borlase, *Antiq.* 237; Borlase, *Naen. Corn.* 79.

¹¹ See p. 366 *infra*.

¹² *Journ. Roy. Inst. Cornw.* iii (1868), 34 and pl.; Borlase, *Naen. Corn.* 37; Evans, *Stone Imp.* 448; *Bronze Imp.* 408.

¹³ *Journ. Roy. Inst. Cornw.* iv (1873), 266.

¹⁴ Borlase, *Antiq.* 214, 237, 290.

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Charlestown ;¹ a bronze ring at Cardinham ;² a bronze dagger 6½ in. long, with two rivets, at Angrowse ;³ a similar dagger with two rivets 4½ in. long, at Harlyn.⁴ These and a celt having the appearance of copper from one of the barrows at Pelynt ;⁵ a metal spear head with two rivets which 'when cut shone like brass' from another ; some bits of brass (?) 'supposed to be parts of a helmet and the point of a brazen sword' from Maen ;⁶ and two bronze bracelets from a barrow at Peninnis Head, St. Mary's, Scilly,⁷ practically complete the list. For although Mr. J. Couch mentions⁸ that the remains of a sword with the handle well preserved have been found 'in a tumulus in Cornwall,' he does not mention either the time or place, and there is no other record of any such discovery.

Objects of stone are even more scarce, a few flint arrow-heads,⁹ scrapers, and chips ; a curious little perforated hammer of greenstone from one of the Pelynt barrows,¹⁰ and an equally curious axe of granite about 4 in. long from Trevalga ;¹¹ a cement button from Boscreggan ;¹² a whetstone and some stone celts from Tregeseal,¹³ are all the barrows have yielded of which records have been kept, except the Roman coins, the presence of which affords evidence of the time when the barrows were being made and used.

Several discoveries of Roman coins in the barrows have been recorded from time to time,¹⁴ but as the evidence was not altogether satisfactory they were regarded with a certain degree of scepticism until the author of *Naenia Cornubiae* opened the barrow on the south-west end of Morvah Hill in 1863.¹⁵ There, inside the kist vaen, Mr. W. C. Borlase found 'several Roman coins,' one of them a 'middle brass' of Constantine, and he states 'that from the position of these coins, their distance from the surface, and the construction of the kist itself, it is quite impossible that by any means they could have reached the situation in which they were found after the covering stone had been once set in its place.' In this barrow was an urn containing burnt bones, placed in the usual type of kist vaen. Except for the fact that it was 'constructed of several layers of stones fitted together one over the other without mortar, forming as it seemed a cone over the entire tumulus,' there was nothing to distinguish the barrow from the general character of the majority.

This find, recorded at the time and made by a man whose great experience in opening Cornish barrows renders his account unquestionable, induces a corresponding faith in the probability of the earlier and less authentic records, one of which contained in a letter from Tonkin to Dr. Gibson, dated the 4 August, 1733, and quoted by Dr. Borlase,¹⁶ is worth special mention as

¹ Borlase, *Naen. Corn.* 188.

² *Journ. Roy. Inst. Cornw.* iv (1875), 214.

³ Borlase, *Naen. Corn.* 236 ; Evans, *Stone Imp.* 314 ; *Bronze Imp.* 243, now in Truro Museum.

⁴ *Journ. Roy. Inst. Cornw.* x (1890), 206.

⁵ *Journ. Roy. Inst. Cornw.* (1845), 34.

⁶ Borlase, *Antiq.* 237 ; Borlase, *Naen. Corn.* 79.

⁷ *Journ. Roy. Inst. Cornw.* (1863), 50 ; Borlase, *Naen. Corn.* 162, now in Truro Museum.

⁸ *Journ. Roy. Inst. Cornw.* (1845), 34.

⁹ Tregiffian, Borlase, *Naen. Corn.* 107 ; Boscreggan, *Journ. Roy. Inst. Cornw.* vi (1879), 201 ; Pelynt, *Journ. Roy. Inst. Cornw.* (1845), 34 ; Botrea, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 234 ; Edmonds, *The Land's End District*, 33 ; Borlase, *Naen. Corn.* 36, 134 ; Bosporthenis, Borlase, *Naen. Corn.* 286.

¹⁰ *Journ. Roy. Inst. Cornw.* (1845), 34.

¹¹ Borlase, *Naen. Corn.* 87.

¹² *Journ. Roy. Inst. Cornw.* vi (1879), 201 ; Evans, *Stone Imp.* 455.

¹³ Borlase, *Naen. Corn.* 131 ; *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1880-1), 20 ; *Journ. Roy. Inst. Cornw.* vi (1879), 191 ; Evans, *Stone Imp.* 84, 269. Two small squared oblong whetstones were found with the urn at Brane Common, Borlase, *Naen. Corn.* 213 ; one is now in Penzance Museum.

¹⁴ Borlase, *Antiq.* 306 ; C. S. Gilbert, *Hist. Survey*, i, 193 ; Drew, *Hist.* i, 377.

¹⁵ Borlase, *Naen. Corn.* 247.

¹⁶ Borlase, *Antiq.* 300 ; Borlase, *Naen. Corn.* 268.

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apparently showing that in some cases the Roman coins were placed in a kist with the urn deliberately. In that instance an urn full of ashes was found in the year 1702 in the parish of Towednack, under 'a prodigious rock' of moorstone 'supported by four pillars of the same,' and beside the urn a round ball of earth, and in this ball four-score silver coins of the late emperors, 'very fair and well preserved.'

It is unfortunate that no measurements of this 'prodigious rock' and the four pillars were kept, as the description would be applicable to a quoit¹ rather than to a kist vaen of the character usual in Cornwall. The distinction between the two is almost entirely a matter of size. While the kists are generally about 2 ft. or 3 ft. square, the tallest side stone in Trethevy quoit² is 9 ft. 8 in., and that at Zennor³ is 8 ft. 7 in.; while the covering stones vary from 8 ft. by 5 ft. at Grugith⁴ to 18 ft. 6 in. by 13 ft. 6 in. at Lanyon.⁵ But the shape of the quoit is in general that of a huge kist vaen having two,⁶ three,⁷ four,⁸ or even six⁹ side stones with one big covering stone resting on them.

Those at Zennor,¹⁰ Mulfra,¹¹ Lanyon,¹² and Carwynnen¹³ have fallen at different times, and the two latter have been restored;¹⁴ but even in these cases it seems as though they had all been merely variations from the type represented by Trethevy¹⁵ and Chyoon,¹⁶ which latter the editor of *Naenia Cornubiae* rightly describes as the 'most perfect and compact' in Cornwall.¹⁷

There is reason to believe that all the Cornish quoits, except perhaps Grugith,¹⁸ which is unique in having only two supporting stones, were originally surrounded, if not covered, by a mound, as some traces of such a structure are found in every instance, except at Carwynnen, where it must be remembered the whole structure fell, and has been restored.

¹ The monuments usually described as 'cromlechs' are always called 'quoits' in Cornwall, where a cromlech or 'grumbler' means a circle, and a tolmen a holed stone.

² *Journ. Roy. Inst. Cornw.* (1850), 31; *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1850), 435; Borlase, *Naen. Corn.* 45; Lukis, *Pre-hist. Stone Mon.*, 11, 13, pl. xxvii; Lysons, *Magna Brit.* ccxix.

³ Borlase, *Antiq.* 231; Borlase, *Naen. Corn.* 51; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 200; (1882-3), 203; Lukis, op. cit. 10, 28, pl. xxi; Lysons, op. cit. ccxix.

⁴ Borlase, *Naen. Corn.* 278; Lukis, op. cit. 10, 29, pl. xxiii.

⁵ Borlase, *Antiq.* 231; Lukis, op. cit. 8, 25, pl. xviii; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 197; Lysons, *Magna Brit.* ccxix.

⁶ Grugith, Borlase, *Naen. Corn.* 278; Lukis, op. cit. 10, 29.

⁷ Lanyon, Borlase, *Antiq.* 231; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 197; Carwynnen, Borlase, *Naen. Corn.* 25; Lukis, op. cit. 11, 29, pl. xxiv; Lysons, op. cit. ccxix.

⁸ Chyoon, Borlase, *Naen. Corn.* 55; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 198; Borlase, *Antiq.* 227; Lukis, op. cit. 9, 24, pl. xx; Lysons, op. cit. ccxix, and pl.

⁹ Zennor, *supra* note (3); Trethevy, *supra* note (2).

¹⁰ Borlase, *Antiq.* 231; Borlase, *Naen. Corn.* 51; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 200; (1882-3), 203; Lukis, *Pre-hist. Stone Mon.* 10, 28, pl. xxi; Lysons, op. cit. ccxix.

¹¹ Borlase, *Antiq.* 230; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 198; Borlase, *Naen. Corn.* 59; Lukis, op. cit. 9, 28, pl. xix; Lysons, op. cit., ccxix.

¹² Borlase, *Antiq.* 231; Lukis, *Pre-hist. Stone Mon.* 8, 25, pl. xviii; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 197; Lysons, *Magna Brit.* ccxix.

¹³ Borlase, *Naen. Corn.* 25.

¹⁴ Lanyon fell in 1815, and was re-erected in 1824. Dr. Borlase says (*Antiq.* 231) in 1759 it was so high that a man could sit on horseback under it; it is now 5 ft. 8 in. in height.

¹⁵ *Journ. Roy. Inst. Cornw.* (1850), 31; *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1850), 435; Borlase, *Naen. Corn.* 45; Lukis, *Pre-hist. Stone Mon.* 11, 13, pl. xxvii; Lysons, *Magna Brit.* ccxix.

¹⁶ Borlase, *Naen. Corn.* 55.

¹⁷ The specimen which gave the name to the townplace of Quoit, on the Goss Moors in St. Columb Major, appears to have been very much like that at Chyoon, but perhaps larger. It fell, and the stones were broken up and removed before 1871; Borlase, *Naen. Corn.* 62.

¹⁸ Borlase, *Naen. Corn.* 278; Lukis, *Pre-hist. Stone Mon.* 10, 29, pl. xxiii.

TRETHERY STONE:

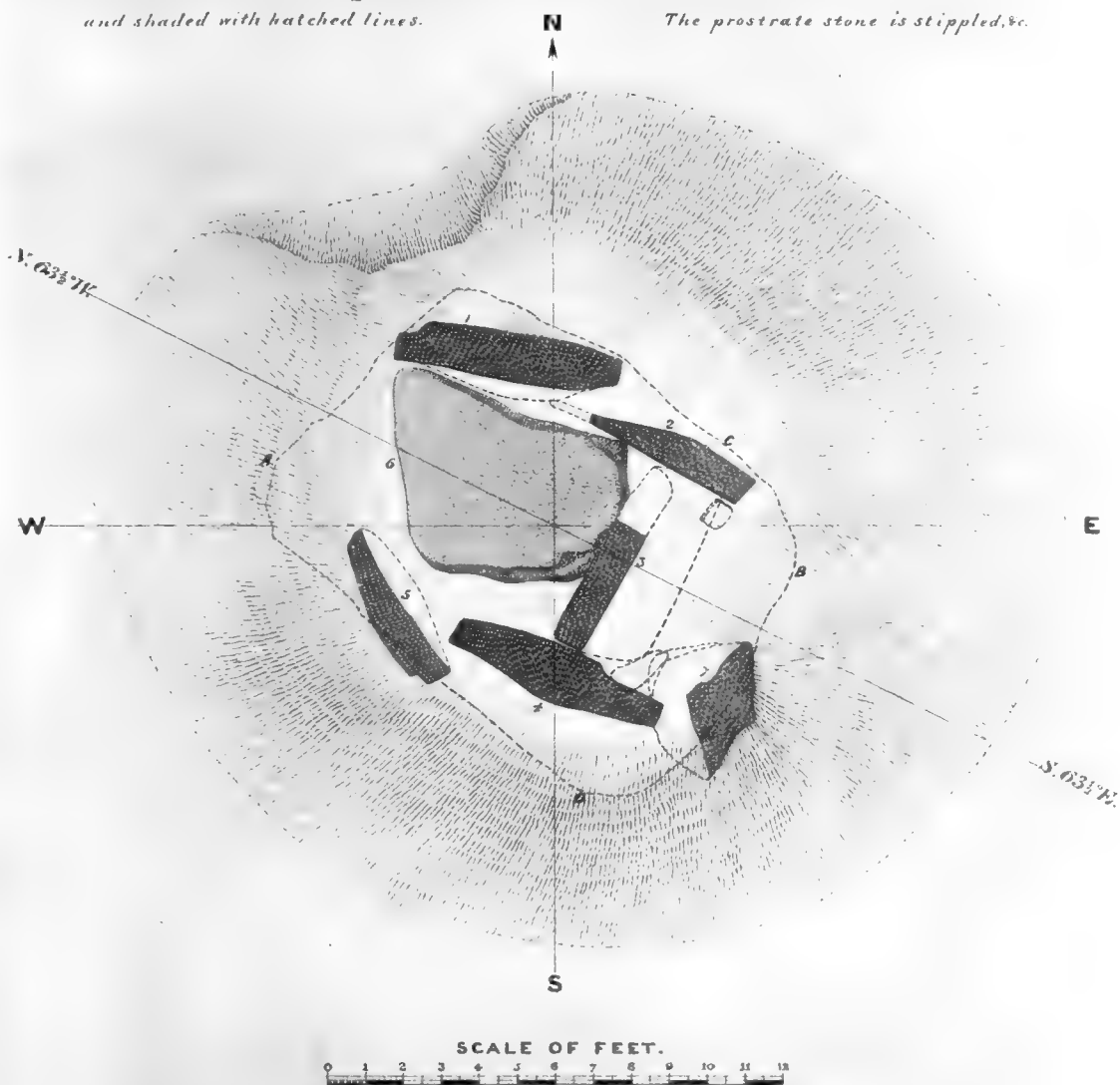
A DOLMEN NEAR ST CLEER,

CORNWALL.

Assumed deviation of the Magnetic Needle, $19\frac{1}{2}^{\circ}$ W.

*Sectional plan of erect stones
taken at the level of the ground
and shaded with hatched lines.*

*Overhangs, and Table-stone with
hole, are drawn in dotted outlines.
The prostrate stone is stippled, &c.*



Measured by C. W. Dymond, C.E., 12th Sept. 1877.

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Of the others Pawton¹ was 'half buried,' Zennor² had 'a stone barrow heaped round about it;' at Lanyon³ there were faint traces; at Trethevy⁴ the barrow, though 'greatly shorn,' was 2 ft. 6 in. in height; at Mulfra⁵ and Chyoon⁶ about 2 ft.; while at West Lanyon⁷ the quoit was completely buried.

The danger and difficulty of working under these great masses of stone have prevented proper examination from being made in most cases. Dr. Borlase records the discovery of a grave about 6 ft. deep under Lanyon which 'had been rifled more than once,' and at Pawton there was found nothing but an empty grave, and here too, as the cover stone is broken, it is possible that it had been searched. There is record of nothing more than 'a small pit' at both Grugith and Chyoon. Some labourers found at Zennor a whetstone and part of an urn, and West Lanyon yielded a broken urn and human bones. Under Mulfra Dr. Borlase found a pit containing peat, clay, and black, greasy loam. There are no accounts of any discoveries at Carwynnen, or Trethevy, but Mr. Pattison⁸ notes of this last that 'the inside has been disturbed and its contents removed.'



TRETHEVY STONE.

These meagre results are not enough to establish any definite conclusions, but as far as they go they do not show any noticeable marks of distinction from the contents of the larger barrows, such as Bosavern,⁹ Trevalga,¹⁰ or Veryan.¹¹ The identity of origin would be much more closely established or disproved if it were only known whether the Towednack monument¹² were a barrow or a quoit.

¹ Borlase, *Naen. Corn.* 32; *Journ. Roy. Inst. Cornw.* (1840), 30; Lukis, *op. cit.* xi, and pls. xxv-xxvi.

² Borlase, *Antiq.* 231; Borlase, *Naen. Corn.* 51; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 200; (1882-3), 203; Lukis, *op. cit.* 10, 28, pl. xxi; Lysons, ccxix.

³ Borlase, *Antiq.* 231; Lukis, *op. cit.* 8, 25, pl. xviii; *Trans. Penz. Nat. and Antiq. Soc.* i, 197; Lysons, *Magna Brit.* ccxix.

⁴ *Journ. Roy. Inst. Cornw.* (1850), 31; *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1850), 435; Borlase, *Naen. Corn.* 45; Lukis, *op. cit.* 11, 13, pl. xxvii; Lysons, *op. cit.* ccxix.

⁵ Borlase, *Antiq.* 230; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 198; Borlase, *Naen. Corn.* 59; Lukis, *op. cit.* 9, 28, pl. xix; Lysons, *op. cit.* ccxix.

⁶ Borlase, *Naen. Corn.* 55; Borlase, *Antiq.* 227; Lukis, *op. cit.* 9, 24, pl. xx.

⁷ Borlase, *Naen. Corn.* 43; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 196.

⁸ *Journ. Roy. Inst. Cornw.* (1850), 32.

⁹ See p. 361 *supra*.

¹⁰ See p. 363 *supra*.

¹¹ See p. 360 *supra*.

¹² See p. 358 *supra*.

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In view of the scarcity of cases of contracted burials in the barrows in Cornwall to which attention has been already directed,¹ the discoveries at Shevioc² and Harlyn Bay³ are of peculiar interest as evidence of the existence of a race of people quite distinct from those by whom the barrows with their accompanying burial urns were created.

At Trethill, in the parish of Shevioc, in 1881, some workmen, making a hole in order to set up a pole, came across a flat stone, and on raising this they found several objects like iron bars. They then saw a skull in the corner, and perceived that it was the remains of a human body doubled up so that the arms were hugging the knees. With the body were fragments of a small earthenware vessel from which Mr. Spence Bate was only able to conclude that it must have been about four inches in diameter. It was ornamented by lines impressed by twisted cord or bark, the ends of which overlapped each other. Ornamentation made in the same way, but apparently more skilfully has been noticed on urns from the barrows.⁴

The kist in which the body was placed was 3 ft. 3 in. long, 3 ft. broad, and 2 ft. 9 in. deep. Mr. Bate, who examined the place immediately after the discovery, had no doubt that it was a genuine case of contracted burial accompanied by a food vessel resembling those found in Derbyshire and elsewhere. The body was placed with the skull in one corner of the kist ('the east or south-east') and lying on the right side; the kist itself, formed of four flat stones, with the soil for a bottom, was almost square. In these details the Shevioc burial differs materially from those discovered at Harlyn Bay in 1900, where the graves are four feet or more in length by two in width, and the bodies generally are found lying on the left side with the head to the north and in the middle of the grave.

HARLYN BAY

Pre-historic antiquities of bronze and gold had already been found in this neighbourhood when, in 1900, while digging for the foundations of a house, an important group of interments within cists, or stone-lined graves, was found.

Under 12 to 15 ft. of fine wind-blown sand, the surface of an old brown sand hill was found, and a few inches under this a large number of shallow stone graves, the sides and ends consisting of flat slabs of slate-stone and the covering stones of the same. A careful removal of the overlying sand showed that there were great numbers of these graves, which were arranged in lines, the graves being placed end to end, a space of about three feet separating the head of one from the foot of the next. There were several of such lines running in parallels, and they have been traced for a length of at least ninety feet, and there is no reason to doubt that they extend into the sand hills to a much greater distance. The majority of the graves were oblong and contained a skeleton lying on the left side facing east in the 'contracted' position, but some were six or eight sided, and one was round, divided in the middle, and some contained remains of more than one skeleton, while in some

¹ See p. 362 *supra*.

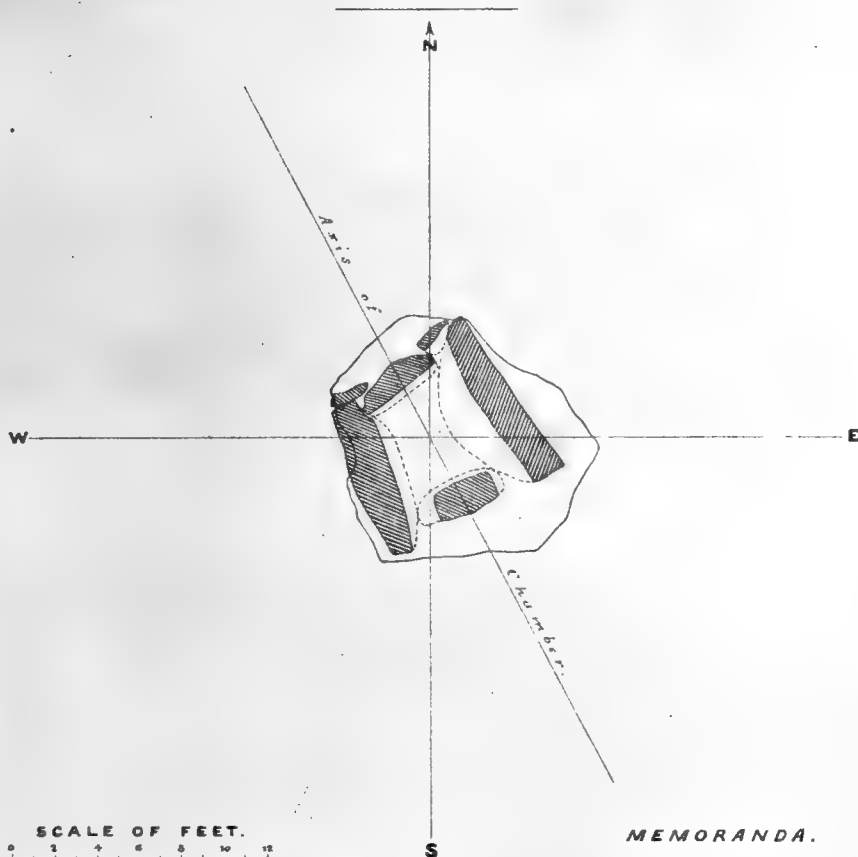
² *Journ. Roy. Inst. Cornw.* vii, 136.

³ *Plym. Inst.* xiii, pl. iii (1900), 203; *Harlyn Bay*, by R. A. Bullen.

⁴ Gerrans, *Borlase, Naen. Corn.* 204; Trevellor, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 231; Edmonds, *The Land's End District*, 31; Borlase, *Naen. Corn.* 208; Denzell Downs, *Borlase, Naen. Corn.* 244; Morvah Hill, *Borlase, Naen. Corn.* 248.

CHYWOON QUOIT, NEAR MORVAH, CORNWALL.

MEASURED & DRAWN BY C. W. DYMOND, C.E., 21ST AUG., 1876.



MEMORANDA.

*Situation, the top of an elevated moorland.
The supporting stones are founded in or on the natural ground, and carry a capstone, measuring about 12' 0" x 11' 6", and about 2' 6" thick. The underside of which is 7' 0" above the floor of the chamber. Around the outside of the Delmen are heaped the remains of a stone cairn, now 2' 6" to 3' 6" high, and about 32' 6" in diameter, a few of the pavement stones on the rim of which are still in situ.
The size of the chamber is, at the bottom, 5' 0" x 5' 9", and at the top 4' 0" x 2' 8"; the side-stones inclining very much inward toward the top.
The longitudinal axis of the chamber points N. 28° E.*



View looking N.N.E. from a photograph.

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the body lay on the right side and in a few on the back. At one place a large number of bones was found thrown together, giving the impression that they had been removed from the graves and collected, perhaps to make room for later interments. The remains were of men, women, and children of various ages, and the general appearances suggested use by a comparatively small number of people through a long space of time rather than by large numbers for a short period. With these remains were found implements of slate, some flint flakes, bronze rings, earrings, bracelets, and fibulae, the latter being very fine. Some of these are thought to date from about the time of the Roman invasion of England, and this is borne out by the fragments of iron, apparently remains of a bracelet, a dagger pommel, and a small hook, which have been recorded.

Pottery is almost unknown amongst these discoveries, but some spindle whorls and beads have been found.

The possibility of the existence in this remote part of Cornwall at a comparatively recent date of a people marked off by this curious burial custom, as distinct from any of the previously known occupants of the county, is particularly interesting, and encourages a hope that the excavations at Harlyn Bay may be continued, and that similar discoveries may be made in other parts. There is a record in Drew's History¹ that in 1778 a violent storm shifted a great quantity of sand on the towans in the parish of St. Minver, in consequence of which 'many coffins of slate-stone were discovered which contained human bones in large quantities,' and with these 'several coins, some rings, and various implements of dress'; these coins, it is said, were dated from 1101 to 1558 A.D., and were preserved by 'Mr. Sandys, the late vicar.' St. Minver is the parish on the other side of the Padstow estuary, and, not far from Harlyn Bay, is equally remote from the main life of the county. It would be most satisfactory, seeing the great likeness of this discovery to the burial ground at Harlyn Bay, if these coins could even now be traced and the accuracy of the account in Drew's History tested.

UNDERGROUND CHAMBERS

Under the head of megalithic remains some particulars have already been given of traces of ancient dwellings.² They are all built after the same manner, a deep wide trench sunk into the ground or excavated into the side of a small hill or rising land, the sides built up with large stones without mortar, the inside facing of the stone being fairly smooth, forming a not uneven surface, and the roof made of long flat slabs of stone laid across from wall to wall, and the whole covered completely with earth. None of them show above the ground level and they are not easy to find. The longest in the county is that at Halligey,³ near Trelowarren, in Mawgan in Meneage, where the main chamber is 90 ft. long, 3 to 5 ft. in breadth, 6 ft. high in the middle, but lower towards the ends, and the smaller chamber at right angles to the east end of the main chamber is 28 ft. long, 5 ft. 6 in. wide and 6 ft. high.

All those which have been thoroughly explored have been found to have one or more smaller chambers connected with them, the opening between

¹ Drew, op. cit. ii, 495.

² The local name is 'Fogou' or 'Vau.'

³ *Journ. Roy. Inst. Cornw.* viii (1885), 243, with plates; *Arch.* xl; Lysons, op. cit. ccxx.

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being a small doorway usually about 3 or 4 ft. in height and about the same in width.¹ The cave at Bodinnar in Sancreed may have consisted of a single chamber only, but it was in ruins in 1769² and had wholly disappeared in 1845.³ That at St. Eval⁴ seems to have been always a single chamber, but it makes up for that deficiency in being the largest in internal dimensions, being 50 ft. long by 8 ft. high and 10 ft. wide, the average size of these structures being from 30 to 40 ft. in length, 5 to 6 ft. in height, and 3 or 4 ft. wide.

The most striking of the class is the cave at Chapel Euny, in Sancreed,⁵ which has on the north side of the main gallery a large round chamber about 14 ft in diameter and 12 ft. high in the centre, with a domed roof of stones, of 'beehive' pattern.

The caves at Chysauster,⁶ Boscaswell,⁷ and Trewardreva⁸ have all been much destroyed, and a portion of the side chamber at Trewoofe¹ has shared the same fate; the others have not been explored or no records have been kept.⁹

There is an underground tunnel about 90 ft. long at Bodean Veor, in St. Anthony in Meneage,¹⁰ but this differs from the regular 'Fogous' in that it is a mere excavation without any stones for walls or roof.

At Trenear, in Wendron,¹¹ is a building of stone, 13 ft. by 9 ft., of which the roof is made of eight blocks of granite, four on each side, standing on the walls and leaning to meet in the middle, forming an acutely pointed roof; at the back of this 'room,' an aperture 3½ ft. high leads into a tunnel 19 ft. long, cut into the 'country,' of which part of the walls are faced with stone. This building was said, in Tonkin's time (1739),¹² to have been a cellar and Trenear house, 'one of the hunting seats' of the 'ancient dukes of Cornwall.'

A few of these caves have been carefully searched. Dr. Borlase examined Pendeen and found in the floor of the second chamber a pit 3 ft. in diameter and 2 ft. deep, 'but nothing in it remarkable';¹³ a similar pit is recorded¹⁴ at Trewardreva which contained ashes. It is stated that an urn containing human ashes, a cup, and some bones, supposed to be those of a deer, were found at Halligey.¹⁵ At Treveneague,¹⁶ which was filled with earth and

¹ Trewoofe, *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 249; Borlase, *Antiq.* (as Bolleit), 292; Lysons, op. cit. ccxx. Chapel Euny, Edmonds, *The Land's End District*, 52; *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1862-5), 14; Lukis, op. cit. 18 and plan. Treveneague, *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1867), 3. Boscaswell, *Journ. Roy. Inst. Cornw.* (1864), ii, 7. Pendeen, Borlase, *Antiq.* 293; Lysons, op. cit. ccxx. Halligey, near Treloar, *Journ. Roy. Inst. Cornw.* viii, pt. iii (1885), 243; *Arch.* xl; Lysons, op. cit. ccxx.

² Borlase, *Antiq.* 292; Lysons, op. cit. ccxx.

³ *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 247; Bateman, *Vestiges*, 5.

⁴ Borlase, *Antiq.* 292; *Journ. Roy. Inst. Cornw.* i, pt. iv (1865), 64.

⁵ Chapel Euny, Edmonds, *The Land's End District*, 52.

⁶ Edmonds, *The Land's End District*, 51.

⁷ Boscaswell, *Journ. Roy. Inst. Cornw.* ii (1864), 7.

⁸ In Constantine, Polwhele, *Hist. of Cornw.* (as Bos au-an), i, 129; Lysons, ccxx, now used as a fowl-house.

⁹ Tremenheere in Mullion, Borlase, *Naen. Corn.* 240; Polkanogou in St. Keverne, Polwhele, *Hist.* i, 129 (note); Altarnun near Roughtor, *Journ. Roy. Inst. Cornw.* (1885), 252; Altarnun at West Carne, *Journ. Roy. Inst. Cornw.* (1888), 342; at Trew in Breage, *Journ. Roy. Inst. Cornw.* (1888), 360; Chysauster in Gulval, Edmonds, op. cit. 51.

¹⁰ Polwhele, op. cit. i, 129.

¹¹ *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1887-8), 348.

¹² Gilbert, *Paroch. Hist.* ii, 138.

¹³ Pendeen, Borlase, *Antiq.* 293; Lysons, op. cit. ccxx.

¹⁴ Polwhele, *Hist. of Cornw.* i, 129; Lysons, op. cit. ccxx.

¹⁵ *Journ. Roy. Inst. Cornw.* viii (1885), 243; *Arch.* xl; Lysons, op. cit. ccxx.

¹⁶ Treveneague, *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1867), 3.

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rubbish, Mr. Blight found pottery (fragments of seventeen different vessels), charcoal, bones of animals, bits of flint and pieces of iron, the largest of these being part of an iron implement which had apparently one cutting edge and was long-bladed. It was made with some skill and is described by Mr. Blight as 'similar to the mediaeval glaive.' This cave also yielded a spindle whorl, a granite mortar, and some stones evidently used for grinding.

In 1863, Mr. W. C. Borlase completed the excavation of the cave at Chapel Euny, which had been partly cleared by a miner some twenty years before. He found in addition to a paved and drained floor, some coarse pottery both black and red, a small piece of 'beautiful red pottery, possibly Samian ware,' an iron crook, an iron spear-head $2\frac{1}{2}$ in. long, and numerous whetstones, mullers, ashes, bones of animals, a small circular stone amulet, 1 in. in diameter, with a hole through the centre and a considerable quantity of partly melted tin.¹

The object for which these structures were made is quite conjectural. The names do not help to any solution. Those at Boscaswell,² Bodinnar,³ and Trew⁴ are each known as the 'Giant's Holt,' but most of the others are simply called the 'Fogou' or 'Vau,' which, with its other form of 'Hugo,' is the Cornish word for a cave. Hal, writing of Trewoofe (Trove), says that 'in the wars between Charles I and his Parliament, divers of the royal party, pursued in the west by the Parliament troops under Sir Thomas Fairfax, were privately conveyed into this vault . . . where Mr. Leveale fed and secured them till they found opportunity to make their escapes.'⁵ It is possible that some such purpose as this was the original cause of their existence, for the caves at Chysauster,⁶ Bodinnar,⁷ Chapel Euny,⁸ and Roughtor⁹ are in the immediate vicinity of hut-circles or dwellings, and at Altarnun¹⁰ and Halligey¹¹ are traces of fortifications. This last was according to Hal also the case at Trewoofe.¹²

The remains of the early dwellings in the county are of two marked varieties. The rudest and apparently earliest are now to be noticed as low circular banks of earth and stone, generally containing some large flat stones still standing on edge; the enclosed area is roughly level or slightly sunk. They are usually found grouped together in large numbers. In Blisland such groups are to be seen at Carwen,¹³ on Kerrowe Down,¹⁴ and on the west side of Challowater.¹⁵ Sir John Maclean speaks of them as existing at Garrah in St. Breward 'by scores';¹⁶ there are numerous examples in Altarnun¹⁷ on Rowtor, on Scaddick hill, at Carne Down, and Hendra. Mr. T. C. Peter¹⁸ found traces of more than 100 on Carn Brea in Illogan; there are several inside the entrenchment of Castle Pencair on Tregoning Hill, in Breage; and a group of five at Colvadnack in Wendron.¹⁹ Very few isolated instances

¹ See p. 368 *supra*.

² *Journ. Roy. Inst. Cornw.* (1864), No. ii, 7.

³ Borlase, *Antiq.* 293.

⁴ *Journ. Roy. Inst. Cornw.* (1888), 360.

⁵ Gilbert, *Paroch. Hist.*, 143.

⁶ Edmonds, *op. cit.* 51.

⁷ Borlase, *Antiq.* 293.

⁸ *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1862-5), 14.

⁹ *Journ. Roy. Inst. Cornw.* (1885), 252.

¹⁰ *Ibid.* (1888), 342.

¹¹ *Ibid.* viii, part iii (1885), 243. *Arch.* xl.

¹² *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 249.

¹³ Maclean, *op. cit.* i, 23 and plan.

¹⁴ *Ibid.* 24.

¹⁵ *Ibid.* 24.

¹⁶ *Ibid.* i, 351.

¹⁷ *Journ. Roy. Inst. Cornw.* ix, pt. iii (1888), 349. *Vestiges*, 19 and plan.

¹⁸ *Journ. Roy. Inst. Cornw.* xiii, pt. i (1895), 93.

¹⁹ *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1887-8), 349.

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are known ; there is a noticeable specimen on the crest of headland at Kenidjack in St. Just ; but probably many more would be discovered by a systematic search on the moors and hills.

They vary very much in size ; from 14 ft.¹ up to 20 are the usual limits ; but some are as much as 40, and even 60 ft. in diameter.² Some of those on Carn Brea are as small as 8 ft., while others are as much as 20 ft.

A thorough examination of those on Carn Brea in Illogan was made by Mr. Thurston C. Peter in 1895. Several of the huts were so constructed that two or more sides were formed of naturally-placed boulders, and most of these had in them hearths or cooking holes or both. These cooking holes were pits sunk into the ground floor of the hut, generally square, but one was triangular. One was lined with stone, a single flat stone on each of three sides, the fourth built up with small stones. The wood ash which came from these cooking holes was of oak, birch, hazel, and alder. All the 'finds' from these huts are in the Museum of the Royal Institution of Cornwall at Truro, and include a large number of well-made flint arrow-heads, some flint celts and scrapers, spindle whorls, two pieces of ground flint, a bronze ring, and a silver denarius of A.D. 70. Apparently no articles of iron of any sort were found.³

This fact, although only negative evidence, combined with their evidently superior structure and design would seem to show that the 'hut-clusters' of Cornwall are of a more recent date than these hut-circles. The hut-clusters, of which perhaps the best preserved is at Chysauster in Gulval,⁴ consist of several rooms or huts within one enclosing wall. The walls are faced with stone on the inside and are in some cases still standing 5 or 6 ft. above the floor level of the contained hut or room. The outside of the wall is an earth bank, and the whole is very thick and solid. Two of these enclosures at Chysauster have been examined, and they are both laid out on much the same ground plan.

In the course of the exploration of the first Mr. W. C. Borlase found that some of the huts or rooms were roughly paved, and more than one contained a hearth. He found black wheel-made pottery in fragments, stone mullers, millstones, and a piece of insufficiently smelted tin in the condition locally known as 'Jew's house tin.'⁵ The second cluster was excavated by the Penzance Antiquarian Society in 1897. Here, too, was rough paving, and in the centre of one hut a large flat stone lying level on the ground, having in it a circular pit, and in the pit a round stone about 5 inches in diameter. There were also found the upper half of a stone hand-mill in good preservation, large quantities of burnt furze wood, fragments of at least twelve vessels of coarse pottery, several hones, and a lump of the stone from which they were made, two very small pieces of rusty iron, and several rounded pebbles.⁶ All these objects are now in the Museum of the Society. Mr. W. C. Borlase records that he had three Roman coins, 'third brasses' of A.D. 265 to 282, which were part of a hoard found at or near the hut-cluster at Bodinnar in Sancreed.⁷ After Chysauster the best specimens of these 'hut-clusters' are to be seen at Bosullow in Madron. Some excavations have been made in these, but not on an extensive scale ; and nothing has been found except

¹ *Journ. Roy. Inst. Cornw.* ix, pt. iii (1888), 349. *Vestiges*, 19 and plan.

² Maclean, *op. cit.* i, 24.

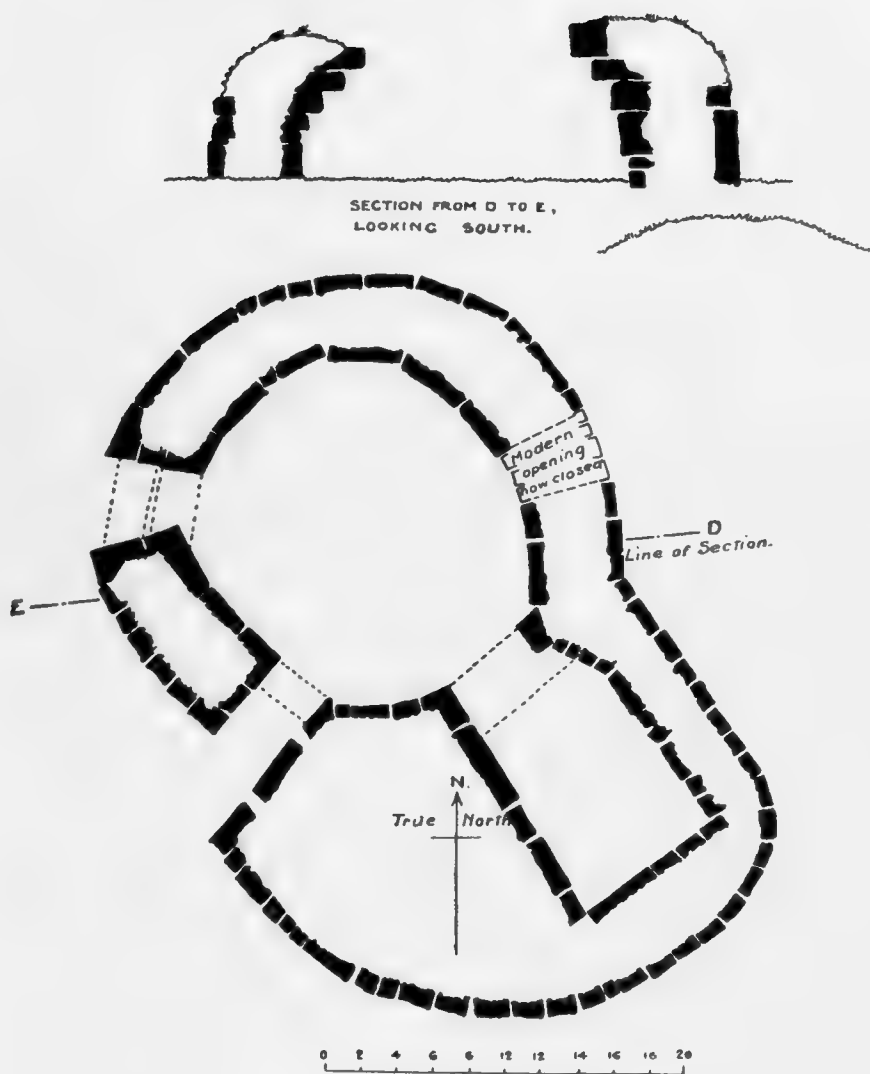
³ Edmonds, *op. cit.* 50 ; Lukis, *op. cit.* 19 and plan ; *Vestiges*, 12.

⁴ Bateman, *Vestiges*, 15.

⁵ Bateman, *op. cit.* 5.

⁶ *Journ. Roy. Inst. Cornw.* xiii, pt. i (1895), 93.

⁷ *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1893-8), 107.



BEEHIVE HUT, BOSPORTHENNIS, ZENNOR.

EARLY MAN

some paving, and quantities of burnt ashes, and fragments of at least seven vessels of pottery.¹ Pottery was discovered in excavating at Trewortha.² Remains at Smallacombe in Linkinhorne³ may on examination prove to be the ruins of a similar cluster. There was a good specimen at Bodinnar,⁴ and there is a more ruinous one at Mulfra in Gulval.⁵ One which Edmonds mentions at Bojuthno is now destroyed.⁶ Dr. Borlase records the existence of a series of similar structures at Chygwidden in Sancreed,⁷ within a protecting rampart, but now all traces of the huts have been removed, and nothing except a part of the rampart remains. Coins are said to have been found in clearing the ruins.

There are a few instances of 'beehive' huts in Cornwall, two⁸ being still in fair preservation. These are circular buildings about 15 feet in diameter; the walls are carried up straight for about 5 feet, above which each course is laid overlapping the one below until the roof meets in the centre. The one at Bosporthennis has an oblong square-cornered room opening out of it, the southern end wall of which appears to have had almost a gable end. There is a curious hut or chamber built in an enormous bank of earth and stones at Ding Dong in Madron.⁹ The bank is faced with stone through which a doorway 3 ft. wide leads into a long chamber, similar to the underground caves previously described; from this another doorway 2 ft. 6 in. \times 3 ft. 6 in. opens into a small square room 9 ft. on each side. This is roofed by four long blocks of granite placed on the walls, which are 4 ft. high, across the corners. Four similar stones are laid across the angles of the first course, and one large single stone covers the remaining space. Although somewhat different and apparently more modern than the beehive huts already mentioned, the 'Culver house' at Bussow, in Towednack,¹⁰ may serve as a fitting conclusion for this notice. It is circular, 18 ft. high, and the dome or roof is formed of eight layers of stone, each overlapping the one beneath it. The small square openings through the walls are supposed to indicate that it was built for use as a pigeon house, but the history of this curious little tower is unknown.

THE EARLY IRON AGE

In addition to the bronze mirror discovered in a grave at Trehan Bahow, St. Keverne, and the bronze collar discovered at Trenoweth, in the parish of Lelant, which are given in Mr. J. Romilly Allen's list of late Celtic objects,¹¹ Sir John Evans¹² recorded the discovery of a bronze brooch at Redmore, near St. Austell, which probably belongs to the Early Iron Age. A bronze fibula inlaid with coral (?), found in tin stream-works at Treloy in St. Columb Major¹³ (now in the Museum at Truro), and a brass jewelled collar found with a bowl of block tin in tin stream-works in St. Stephen in Brannell,¹⁴ (now in the Museum at Truro), present certain features which resemble late Celtic ornaments from Yorkshire, and there is no reason to doubt that they belong to the same period.

¹ *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 286.

² *Journ. Roy. Inst. Cornw.* xi, 290.

³ *Journ. Roy. Inst. Cornw.* iii (1868), 10.

⁴ Edmonds op. cit. 46; *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 247; Bateman, op. cit. 3.

⁵ Bateman, op. cit. 15.

⁶ *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 249.

⁷ Bateman, op. cit. 16.

⁸ Bosporthennis in Zennor, Lukis, op. cit. 19, fig. xxxix; J. Romilly Allen, *Arch. Camb.* ix; Bateman, op. cit. 16. Fernacre near Brownwilly, Bateman, op. cit. 8 and sketch.

⁹ Bateman, op. cit. 7.

¹⁰ Bateman, op. cit. 8.

¹¹ *Arch. Camb.* (Ser. 5), vol. xiii, 331.

¹² Evans, *Bronze Imp.* 400.

¹³ *Journ. Roy. Inst. Cornw.* iv, 220.

¹⁴ *Ibid.* iii (1869), xi.

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THE 'LONGSTONES'

This list contains the single upright stones, which are conspicuous for their great height, and those which have been shown by excavations, or other methods of observation, to be artificial in origin and connected with the subject of this chapter. In the present limited state of scientific knowledge as to their origin it has been considered best to omit, as natural, all which do not come under either of the foregoing descriptions.

CONSTANTINE.—'Men Perhen': 20 ft. in height; broken into twenty gate-posts in 1764. Borlase, *Antiq.* 162.

LELANT.—At Bosava (sic, ? Beersheba), 10 ft. in height. Blight, *Crosses of W. Cornw.* 71.

LUDGVAN.—At Tremenheere; now destroyed. Borlase, *Naen. Corn.* 95.

MADRON.—At Trewren. Two stones, 5 ft. and 6 ft. in height respectively; 10 ft. apart, ENE. In excavating between them on 21 October, 1752, a grave was found 6 ft. 6 in. long, 2 ft. 9 in. wide and 4 ft. 6 in. deep, containing black greasy earth. Borlase, *Antiq.* 187; Borlase, *Naen. Corn.* 22. At Boswarthen, about 8 ft. in height. At Mulfra, 'a little below the Cromlech, is a stone 15 ft. long, which seems to have been formerly erect.' Canon Rogers quoted in Borlase, *Naen. Corn.* 99.

MORVAH.—Kerrow hill, 6 ft. in height. Blight, op. cit. 71.

PAUL.—At Chyenhal, 8 ft. in height. Blight, op. cit. 71. At Tresvenneck, 12 ft. in height. A slab of granite was turned up by the plough at the foot of the 'pillar,' in April, 1840. It covered a very large urn, and a small one was found about 18 in. away. Both are now in Penzance Museum. *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 233. Edmonds, *The Land's End District*, op. cit. 32.

ST. AUSTELL.—Near Mount Charles, 11 ft. 6 in. in height. Borlase, *Naen. Corn.* 99.

ST. BREOCK.—On Downs. Two stones, 12 ft. 4 in. and 8 ft. in height respectively. Borlase, *Naen. Corn.* 96; Lukis, *Prehist. Stone Mon.* 76, pl. xxxi.

ST. BURIAN.—'The Pipers,' at Bolleit, 15 ft. (the tallest now standing in Cornwall) and 13 ft. 6 in. respectively. Excavations made under the tallest produced nothing. Borlase, *Naen. Corn.* 107; Blight, op. cit. 71; Lukis, op. cit. 14, pl. xxx. At Boscawen Un, 8 ft. 6 in. in height. Blight, op. cit. 71. At Goon Rith, 10 ft. 6 in. in height. Excavations produced nothing. Borlase, *Naen. Corn.* 107; Blight, op. cit. 71; Lukis, op. cit. 14, pl. xxx. At Pridden, 11 ft. 6 in. in height. Excavations disclosed a small pit containing splinters of burnt bone, under a cover stone. Borlase, *Naen. Corn.* 101. At Boscawen Ros., 10 ft. in height. Blight, op. cit. 71 (as Tregiffian). Borlase, *Naen. Corn.* 108. At Trelew, 10 ft. 4 in. in height. Excavations disclosed splinters of burnt bone and burnt clay. Borlase, *Naen. Corn.* 102; Lukis, op. cit. 14, pl. xxx; Blight, op. cit. 71.

ST. COLUMB.—'The Old Man,' 7 ft. 6 in. in height. 'Once apparently surrounded by a small circle of stone set on edge.' Borlase, *Naen. Corn.* 99; Lukis, op. cit. 15, pl. xxxi, now destroyed.

ST. JUST.—Blight (*Crosses of W. Cornw.*) mentions one at Brew, but there is no such place in the parish; and another at Longstone Downs, Boslow, but this is at Boswens, Sancreed, q.v.

ST. KEVERNE.—At Tremenheere, 9 ft. 5 in. in height. Borlase, *Naen. Corn.* 277.

ST. MABYN.—'Longstone,' a little E. of the church, removed and broken up 'to brave ridiculous legends and superstitions,' Maclean, op. cit. ii, 451.

SANCREED.—At Boswens, 9 ft. in height. Borlase, *Antiq.* 163 and pl.; Blight, op. cit. 71. At Drift or Trigganeris. Two stones, 8 ft. 6 in. and 6 ft. in height respectively, and 16 ft. apart. Excavations disclosed a grave between them 6 ft. long, 3 ft. wide, and 5 ft. deep; it was empty. Borlase, *Antiq.* 187; Blight, op. cit. 71; Borlase, *Naen. Corn.* 23; Lukis, op. cit. 15, pl. xxx. At Trenuggo, 11 ft. 2 in. in height. Bones, chips and ash found at foot. Borlase, *Naen. Corn.* 102; Lukis, op. cit. 14, pl. xxx; Blight, op. cit. 71.

SITHNEY.—On Longstone Down, 11 ft. in height. Borlase, *Naen. Corn.* 99.

WENDRON.—Near Burras, about 10 ft. in height, in a field on the E. side of main road.

ZENNOR.—Porthmeor, 6 ft. 8 in. in height. Lukis, op. cit. (as Polmeor) 15, pl. xxx.

THE HOLED STONES

The most striking monuments of this description in Cornwall are :—

THE MÈN-AN-TOL in Madron, consisting of two upright stones, each about 4 ft. in height, now standing 19 ft. apart; midway in the line between them stands a flat stone roughly circular,

THE MÊN-AN-TOL WITH ITS ASSOCIATED STONES, 4c,

BOSSULLOW DOWNS, NEAR MORVAH, CORNWALL.



EARLY MAN

- 4 ft. in diameter, having a rounded hole through it, 21 in. by 19 in. in diameter. The westernmost stone has been moved and brought into a straight line with the other two since 1815. Borlase, *Antiq.* 177 and pl.; Paris, *Guide to Mounts Bay*, 77; Edmonds, op. cit. 19 and 212; *Journ. Roy. Inst. Cornw.* iv (1872), 152; Lukis, op. cit. 17, pl. xxxiv.
- ST. BURIAN.—At Rosemoddress, N. of circle. The stone is 5 ft. 4 in. in height, now used as a gate-post; the hole is 5½ in. in diameter. Borlase, *Naen. Corn.* 214; Lukis, op. cit. 17, pl. xxxiii; *Journ. Roy. Inst. Cornw.* (1862), 27. At Rosemoddress, E. of circle, now used as a gatepost. Borlase, *Naen. Corn.* 214; Lukis, op. cit. 1 and 22.
- ST. JUST.—The four-holed stones at Tregeseal are described in the chapter on 'The Stone Circles' (*post*). At Tregiffian; the stone roughly round, 2½ ft. in diameter, the hole 6 in. in diameter; moved and now lost. Lukis, op. cit. 17 and 27, pl. xxxiii.
- SANCREED.—At Boswarthen. Stone 3 ft. 3 in. in height; hole near the top 3½ in. in diameter. Now used as a gatepost. Lukis, op. cit. 17, pl. xxxiii.
- TOLVAN.—Near Gweek, in Constantine, a triangular flat stone, upright, 7 ft. 9 in. in height; near the exact centre is a hole 1 ft. 4 in. in diameter. *Journ. Roy. Inst. Cornw.* (1862), 24; Lukis, op. cit. 17, pl. xxxiii.
- WENDRON.—Similar to the Tregiffian Stone, but the hole is not in the centre. Lukis, op. cit. 17, pl. xxxiii.

There are probably many more holed stones of this description in the county, which are not recorded. The small square stones with large holes, such as those at Trelew in St. Burian¹ and in the lane leading to Rosemoddress² are axle-stones, made to take the wooden axles of the water-wheels, before iron was used.

ANCIENT BRITISH COINS

Examples of uninscribed gold coins of the types recorded by Sir John Evans,³ as Plate A, Nos. 4 and 5; Plate B, No. 6; Plate D, No. 4; and Plate E, No. 9, have been found at Carn Brea. Borlase, in his *Antiquities of Cornwall* (1754), gives a plate showing twenty-five of these coins.

Another coin, inscribed 'Catti,' was found at Camborne⁴ in the year 1865.

QUERNS, ETC.

In Cornwall, especially in the west, stone querns are found in considerable numbers, both round and saddle, and others which are merely a circular pit in a large flat stone with a round handstone for grinding: specimens of these latter were found in Chyoon Castle and in one of the huts at Chysauster. Although querns of this sort are very primitive, there is reason to believe that they were in use in Cornwall down to a comparatively late date. There is a particularly good collection of these in the Penzance Museum. Circular flat stones are also often found, the use of which is at present unknown. Stone bowls or basins, some not more than 3 in. in diameter, are also found; these are always of very neat finish and may have been in many cases stoups used in the old chapels or oratories.

TOPOGRAPHICAL INDEX OF SMALL ANTIQUITIES

ALTARNUN.—Flint scrapers, knives, arrow-heads, etc., at Trewint Moor. *Journ. Roy. Inst. Cornw.* (1888), 350.

There is said to be an underground building or fogou at West Carne. *Journ. Roy. Inst. Cornw.* (1888), 342, and another between Roughtor and Buttern Hill. *Journ. Roy. Inst. Cornw.* viii (1885), 252.

BODMIN.—Stone with pit-marking. *Journ. Roy. Inst. Cornw.* x (1890), 188.

¹ Lukis, op. cit. 17, and pl. xxxiii, No. 4.

² Borlase, *Naen. Corn.* 214; Lukis, op. cit. 1 and 22.

³ Evans, *Anct. Brit. Coins*, 50, 51, 62, 81, 94.

⁴ Evans, *Anct. Brit. Coins*, 488.

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- BREAGE.—Some bronze flanged palstaves found in Godolphin Mine between 1740 and 1750. Borlase, *Naen. Corn.* 41.
- CAMBORNE.—Stone Axe found at Higher Rosworthy, now in Penzance Museum. *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1880-1), 74.
- CARDINHAM.—Bronze ring, found in barrow at Venns Cross. *Journ. Roy. Inst. Cornw.* iv (1875), 214.
- CREED.—Urn found in a barrow about 1724. Drew, *Hist.* ii, 186.
- CROWAN.—Polished flint celt, found at Clowance in 1766. Borlase, *Antiq.* 287 and pl.
- CURY.—Four polished greanstone celts, found at Bochym in 1869. Evans, *Stone Imp.* 130.
A round stone with pointed ends, found at Bochym. Evans, *Stone Imp.* 242.
Urn, fragments in Truro Museum.
- FALMOUTH.—Polished celt of jadeite, now in Truro Museum. Borlase, *Naen. Corn.* 3; Evans, *Stone Imp.* 107.
Urn from Pendennis, fragments now in Truro Museum.
- HELSTON.—Fragments of an urn from Carminow, now in Truro Museum.
- ILLOGAN.—At Carn Brea: flint arrow-heads, Evans, *Stone Imp.* 389; a scraper, op. cit. 309; a flint knife, op. cit. 331; a flint lance-head, op. cit. 334.
- MORVAH.—Urn found at Carne. Drew, ii, 497; Borlase, *Nat. Hist.* 322; Borlase, *Naen. Corn.* 182.
- MULLION.—Urn found at Winnington, now in Truro Museum.
- PERRANZABULOE.—Pieces of iron and brass money found in barrows. Borlase, *Antiq.* 311.
- REDRUTH.—Barbed flint arrow-head from four barrows, now in Penzance Museum.
- ST. AGNES.—Barbed flint arrow-head. Evans, *Bronze Imp.* 389.
- ST. BREWARD.—Three curious pointed stones found near Bradford. Maclean, i. 351.
- ST. COLUMB MINOR.—Flint axe-head. Borlase, *Naen. Corn.* 4.
Rock markings. *Journ. Roy. Inst. Cornw.* x (1890), 190.
- ST. IVES.—There is a curious double-walled hut at Carn Ellis. *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1882-3), 199.
- ST. JUST.—Two small stone bowls found at Leswidden. Borlase, *Antiq.* 310.
An urn found at Leswidden. Borlase, *Antiq.* 310.
Stone Celt, found at Kelynack Moor, now in Penzance Museum. *Trans. Penz. Nat. Hist. and Antiq. Soc.* i, 19.
Stone axes found at Tregeseal Circles. *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1880-1), 20.
- SANCREED.—An urn, now in Penzance Museum, and two perforated stones, one of black marble, the other a brown sandstone, found near Chapel Euny in 1842. Borlase, *Naen. Corn.* 212.
- TRURO.—Polished stone celt. Evans, *Stone Imp.* 138.
Bronze celt found at Mopus. Borlase, *Naen. Corn.* 5.
- ZENNOR.—Whetstone from the Quoit in Penzance Museum. *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1882-3), 203.
Urn from hill above Pennance, now in Penzance Museum. *Trans. Penz. Nat. Hist. and Antiq. Soc.* (1883-4), 310.

ANGLO-SAXON REMAINS

AMPLE reasons for the marked absence of Anglo-Saxon remains dating from the Pagan period in Cornwall may be found in the political history of the county; but a remarkable memorial of King Alfred's time must here be specially mentioned. In the year 1774 some miners who were searching for tin in a stream-work near St. Austell, in the manor of Trewiddle, found, about 17 feet below the surface, a silver cup and a number of coins and ornaments, most of which were presented to the British Museum, in 1880, by Mr. J. J. Rogers, M.P.¹ The cup had been placed in a heap of loose stones, the refuse of an old tin-working, and covered with a common slate. It was evident that the objects had been intentionally deposited where they were found, the cup containing the rest of the hoard; but after being so deposited, the metal had been considerably crushed by the collapse of the covering slate, and the cup has only been recently restored to its original shape (fig. 1).² It was, however, at once recognized as a chalice, and had been made in three pieces, the baluster stem being separate and somewhat thicker than the bowl and domed foot. Though devoid of ornament or inscription, it can be accurately dated by an examination of the silver pennies found within it. A detailed list of these, in the possession of Mr. Philip (and subsequently of Jonathan) Rashleigh, is given by Mr. Rogers,³ which may be summarized here:—one each of Offa (757–796), Coenwulf (796–822), and Beornwulf (823–825), nine of Berhtwulf (839–853), thirty-nine of Burgred (853–874), and one of Ceolwulf II (874), the last king of Mercia; a silver penny (not as usual a styca) of Eanred, probably the king of Northumbria (807–841), two of Ecgbeorht (802–838), six of Ethelwulf (838–858), two of Ethelred I (863–871), two of Alfred (871–901), five of Ceolnoth, archbishop of Canterbury (833–870), and a single specimen of Louis le Débonnaire, king of the Franks (814–840). As many as 114 pieces were found altogether, but they passed into several hands, and only two or three are now preserved with the other articles, one being an unpublished variety of Ethelwulf, struck at

¹ The donor exhibited the find to the Society of Antiquaries in that year (*Proceedings*, viii, 313), but it had been already illustrated by the Society in 1788 (*Arch.* ix. 187, pl. viii). An account is also given in *Arch. Journ.* xxi (1864), 183.

² The illustration in *Arch.* xi, pl. vii, is now seen to be unsatisfactory.

³ *Journ. Roy. Inst. of Cornwall*, ii (1866–7), 295.

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Canterbury by the moneyer WFA. The occurrence of a coin of Ceolwulf in this hoard shows that the deposit cannot have been made earlier than 874, while the small number of Alfred's coins included, points to the earlier years of his reign. There can be little hesitation, therefore, in fixing the date between 874 and 880.



FIG. 2. GOLD FILIGREE
PENDANT FROM TRE-
WHIDDLE. $\frac{1}{4}$

Four objects belonging to the hoard had been lost sight of before 1866, but they were illustrated with the rest by Mr. Philip Rashleigh¹ in 1788, and are here reproduced. A gold pendant (fig. 2) consists of a thin looped plate to which is applied filigree work in six closely-coiled spirals, the ground being furnished with annulets of the same material. The other piece of gold was a small angular ingot; and of two silver finger-rings one (fig. 3) had a quatrefoil bezel apparently inlaid with niello, the designs resembling those on the polygonal head of the pin (fig. 6), while the other (fig. 4) was of uniform breadth, the hoop being faceted in a manner not unlike the well-known ring of Alhstan, bishop of Sherborne (823-867), and no doubt inlaid with similar material.

The scourge or *disciplinarium* (fig. 7) included in the hoard has met with a better fate, and is in perfect preservation. It consists of a double-plaited silver chain of 'Trichinopoly' pattern, looped in a large glass bead at one end, and at the other divided into four short chains terminating in knots. Seven plaited slides of silver wire are placed at intervals, and the total length is $21\frac{1}{2}$ inches. There can be no doubt that this formidable instrument was intended for penitential purposes, and it would be difficult to find another of the kind, at least in such perfect condition. A similar chain, 15 inches long, with similar crossbands but without the four 'tails,' was indeed found in a woman's grave of the Viking period at Ballinaby, near Loch Gorm, in the island of Islay off the west coast of Scotland; but even if it had been originally part of a scourge, it had evidently been last used as a personal ornament.



FIG. 3. SILVER FIN-
GER - RING FROM
TREWIDDLE. $\frac{1}{4}$



FIG. 4. SILVER FIN-
GER - RING FROM
TREWIDDLE. $\frac{1}{4}$

It is perhaps significant that the site was only about forty miles due south of the famous Iona, the cradle of the Scottish church, and another feature of the Trewhiddle find suggests that it was the property of a religious ascetic. Apart from the chalice there was evidently an ecclesiastical significance in the equal-armed cross engraved on the back of an oval silver box (fig. 5), the use of which is not altogether clear. It is bottomless and has a flat lid unsecured, while the sides are engraved in panels containing beaded crosslines. It may have belonged to some perishable vessel of wood or horn that was also decorated with the three silver bands (fig. 8) which diminished in proportion and seem to have been affixed to some vessel of circular section intended to be seen only from one side. All these are inlaid with niello, and the design of the smallest band is a free scroll of foliage, while the other two have triangular panels filled with grotesque animals and geometrical devices, such as are

¹ *Arch.* ix, pl. viii.



FIG. 1.—SILVER CHALICE FROM TREWHIDDLE. ($\frac{1}{2}$)

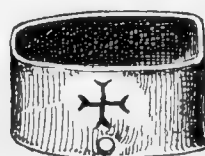


FIG. 5.—SILVER BOX WITH CROSS FROM TREWHIDDLE. ($\frac{1}{1}$)



FIG. 6.—SILVER PIN AND DETAILS FROM TREWHIDDLE. ($\frac{1}{1}$)

ANGLO-SAXON REMAINS

seen on a few surviving relics that may be referred to the same period.¹ The style has most affinity with that of the Merovingian illuminated manuscripts, but seems to have been specially developed on English soil, while on the Continent a new era began with the accession of Charlemagne. The pin with polygonal head (fig. 6) is ornamented in the same manner, and was perhaps used for securing a loosely-woven fabric, as was also the penannular brooch (fig. 9). This bears a close resemblance to one found at Croy, Inverness-shire, with a coin of Coenwulf, king of Mercia (795-818), and both belong to a comparatively early stage in the interesting evolution of this type of brooch, which culminated in the famous Tara and Hunterston examples.

Other items were bronze strap-ends for facilitating the use of the buckle, one example of the latter, without a tongue, being included in the find. Also connected with a strap were two bronze runners with oblong opening and lozenge-shaped top for keeping together overlapping lengths of leather: these, and one pair of tabs, were devoid of ornament, but the other pair was engraved and inlaid with niello in animal patterns (fig. 10) similar to those on the two longer bands.

It is indeed a piece of good fortune that coins were found in undoubted association with this hoard, as otherwise there would either have been a lively controversy about its date, or the discovery would have passed into oblivion altogether. As it is, we have here one of the few landmarks in later Anglo-Saxon art, and can determine by its means not only the relative but the absolute date of several other relics. Towards the close of the ninth century



FIG. 10. SILVER TAG
OF STRAP. $\frac{1}{4}$

England was exposed to the ravages of Danish piratical hordes, and it may be that these treasures were hidden in the ground during one of the attacks on the western coast recorded in history. The year 877 is marked by a disaster of that kind; and the following year the Danes appeared in twenty-three ships, and no doubt spread terror and devastation far inland. Any Christian priest or hermit would then have had every reason to conceal the few church vessels and valuables in his possession, in the hope of quieter times.

The art of the silversmith here exemplified is of a distinctly high order, and though related to the Merovingian school may be looked upon as that prevailing in Alfred's time in England. The absence of any Irish elements enables us to determine with some degree of certainty the ecclesiastical relations of the West Welsh, who had till the year 823 been independent in Cornwall. Egbert had left the court of Charlemagne in 802 to ascend the throne of Wessex, and had marched into Cornwall first in 815, but towards the end of his reign found the natives combining with the Northmen against him, and the decisive blow only came in 835 at Hengestdun (Hingston Down). The intimacy of their first Saxon overlord with the Frankish court may account for the adoption of the ornamental designs and processes here employed, and may also have led to the immigration of a certain number of Frankish



FIG. 9. SILVER PENANNU-
LAR BROOCH. $\frac{1}{4}$

¹ These are detailed in *Proc. Soc. Antiq. Lond.* xx (1904), 54.

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ecclesiastics. An English bishopric was not created in Cornwall till 931, and the following succession is put forward ¹ as the probable course of Christian activity in the west country. The Irish saints here date between 450 and 550 A.D., and the Welsh saints between 550 and 682, while the Armorican phase was the last of native Christianity previous to its absorption into the English system. The conclusion then is reasonable that this deposit was made by some ecclesiastic, monk, priest or hermit, who had perhaps come over from the opposite coast of France or at least had dealings with the Church in Gaul, and was driven to hide his treasures during the Danish incursions that ushered in the reign of King Alfred.

¹ Borlase, *The Age of the Saints*, 174.



FIG. 7.—SCOURGE OF SILVER CHAIN FROM TREWHIDDLE. ($\frac{3}{4}$)

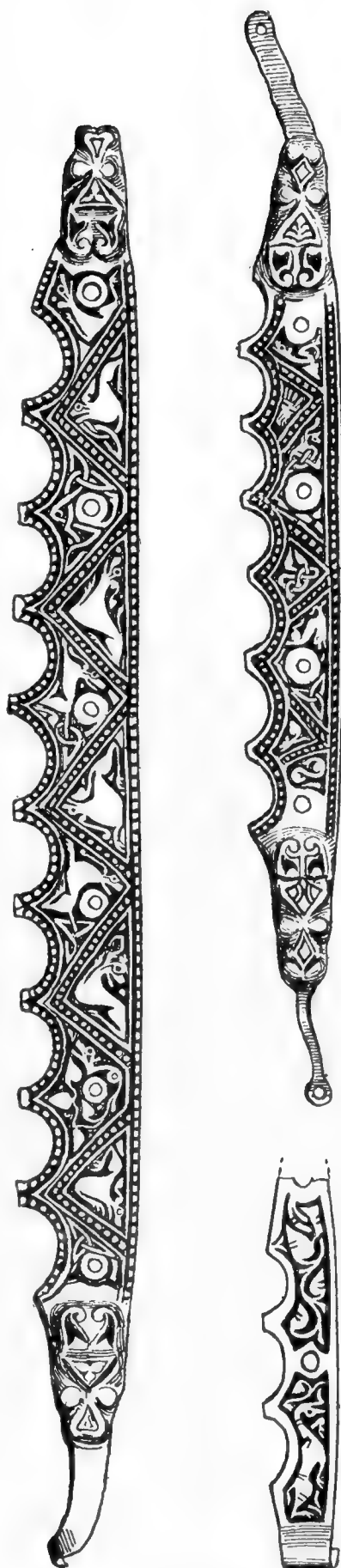


FIG. 8.—SILVER MOUNTS WITH NIELLO FROM TREWHIDDLE. ($\frac{1}{4}$)

MAP showing THE STONE CIRCLES of CORNWALL.

Scale of Miles



Reference

- 1 Tregaseal 12 circles - St Aust Parish - Southern side of Carr Kerigack
- 2 Boscawen Gr. Bude Parish - on S.E. of road
- 3 Dawns men Bude Parish - on S.E. of road
- 4 Boskednan Major Parish
- 5 Wendron 2 circles - E. of and close to road from Redruth to Wendron
- 6 Tripod Stones Bisan Parish - E. of road to Bradford Bridge
- 7 Simple Stones Bisan Parish - S.E. side of Hawk's Tor
- 8 Leaze St Brevard Parish - R. bank of De Lank River
- 9 Stannon St Brevard Parish
- 10 Fenniche - S. of Poughon
- 11 Nine Stones - border of Penryn, Altarnun and North -
- 12 Runers 3 circles - border of St Aust and Looe Parishes.
S.W. of Cheseaway
- 13 Duloe close to and N.E. of Duloe church



STONE CIRCLES

IF any excuse be sought for devoting a special article to stone circles in the history of a county so rich in prehistoric remains, it must be found in the great development of these particular monuments in Cornwall. Within the county area are found stone circles of several varieties, grouped in twos and threes, or standing singly, with stones wide apart or close together, with as few as eight and as many as seventy. The question immediately arises—What is a stone circle? and in trying to answer it we can hardly do better than accept the definition given by the late William Copeland Borlase, F.S.A.,—that when the stones are set up on end, at some distance apart, and enclose a level piece of ground, it constitutes a ‘stone circle,’ but when the stones are set on their edges, contiguous to each other, and enclose a rock, mounds, or an area of uneven ground, it is a ‘ring barrow’ and sepulchral in character. Most of the Cornish circles belong to the former class, but whether they are sepulchral or not is still an open question, and though one indeed, that at Duloe, appears to be undoubtedly sepulchral, for the rest such evidence as there is points to a ceremonial use rather than to burial.

BOSCAWEN-ÛN

| No. | Height | Remarks | Breadth | Thickness | No. | Height | Remarks | Breadth | Thickness |
|-----|---------|---------|---------|-----------|-----|------------|------------------|---------|-----------|
| | ft. in. | | ft. in. | ft. in. | | ft. in. | | ft. in. | ft. in. |
| 1 | 3 10 | | 2 7 | 1 0 | 13 | 3 3 | | 2 7 | 0 8 |
| 2 | 3 9 | | 2 1 | 1 9 | 14 | 4 3 | quartz | 3 3 | 3 10 |
| 3 | 3 5 | | 2 8 | 1 1 | 15 | 4 5 | leans in | 4 3 | 2 8 |
| 4 | 3 8 | | 3 3 | 2 2 | 16 | 3 8 | | 2 3 | 1 9 |
| 5 | 4 7 | | 2 3 | 2 6 | 17 | 3 6 | | 2 9 | 1 8 |
| 6 | 3 8 | | 1 10 | 1 10 | 18 | 3 3 | | 3 1 | 1 3 |
| 7 | 3 5 | | 1 11 | 1 3 | 19 | 3 5 | | 2 7 | 1 8 |
| 8 | 4 3 | | 2 3 | 1 7 | 20 | 9 0 | centre stone, | 2 10 | 1 3 |
| 9 | 3 7 | | 2 10 | 1 8 | | | leans out | | |
| 10 | 3 8 | | 2 7 | 1 7 | | | 3 8 | | |
| 11 | 3 8 | | 2 7 | 1 6 | (a) | flat stone | 3 10 | 3 6 | — |
| 12 | 3 2 | | 3 4 | 1 10 | (b) | „ | 2 10 | 3 11 | — |

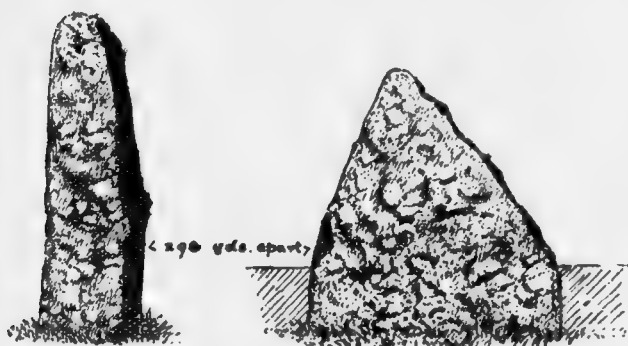
Boscawen-ûn Circle is situated in the parish of Buryan, $4\frac{1}{2}$ miles west of Penzance, on a farm of the same name, south of and near to the road to the Land's End, and having been restored and well cared for by a former landowner, and protected also by the present proprietor, Mr. T. B. Bolitho, it is now one of the most perfect examples

A HISTORY OF CORNWALL

left in the county, or in the country. It is elliptical in shape and comparatively small, the greater diameter (8 to 17) being 81 ft. 3 in. and the lesser (4 to 13) 72 ft. 6 in. There are nineteen stones in the ring, all of moderate size, and one in the centre rather larger, which stands 9 ft. out of the ground and leans towards the north-east. As will be seen by the above table no other stone exceeds 4 ft. 7 in. in height; one (14) is of quartz and the rest are of granite. The photograph gives a good idea of the appearance of the circle, and the plan shows in detail the position of the stones. Only two other circles in the county, Stripples Stones and Nine Stones, possess a central monolith, and the stone in the latter is of doubtful antiquity. This leaning stone has been thought to act the part of a gnomon in a sundial, but Dr. Stukeley's suggestion, 'that somebody digging by it to find treasure disturbed it,'¹ commends itself as reasonable. The average spacing is 11 or 12 ft., but a gap of 22 ft. on the west side would allow room for another stone, if such existed. Between two standing stones on the north-east lie two flat stones, the halves of a large stone, which, according to W. Cotton's plan of 1826, formerly lay outside the circle and at right angles to its present position. Dr. Borlase took it to be part of a dolmên, and it has

the appearance of the covering stone of a kist-vaen.

Having examined the monument itself we may turn our attention to its immediate neighbourhood. North-east of the circle are two menhirs, sketches of which are here given. The nearer one is 8 ft. 11 in. high and is distant 416 yards (N. 44° E.) from the circle, the top being just visible over intervening hedges; the farther menhir is 7 ft. 5 in.



MENHIRS NEAR BOSCAWEN-UN



high and stands in the hedge of the lane leading to the farm; it is 690 yards from the circle (N. 54° E.) and not visible from it; these two menhirs stand west-south-west (S. 72° W.) and east-north-east of each other. There are two small barrows near by. On the south-west, 60 yards away, is one which was opened in 1864 and yielded a small urn, now in the Penzance Museum, a portion of a stone mortar and a flat stone; in the centre is a large granite boulder, sometimes called the 'money rock.'² Another barrow, on the south-east, was opened by W. C. Borlase, who found a small urn and some minute pieces of bronze, possibly the rivets of a dagger.³

¹ W. C. Lukis and W. C. Borlase, *Prehistoric Monuments of the British Isles: Cornwall* (1885), p. 1.

² J. T. Blight, *Churches of West Cornwall* (1865), pp. 123-4.

³ *Nenia Cornubiæ* (1872), p. 219.



R. H. Preston

[Penzance]

BOSCAWEN-ÛN,
From the South-east. Chapel Carn Brea in the distance.



R. H. Preston

[Penzance]

DAWNS MÉN,
From the North.

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STONE CIRCLES

The very first reference to this circle that we find is in a Welsh triad, quoted by the Rev. John Williams ab Ithel. It runs as follows :—

The three principal Gorsedds of the Isle of Britain :
the Gorsedd of Meriw hill ;
the Gorsedd of Beiscawen ;
and the Gorsedd of Bryn Gwyddon.

or another version :—

the hill of Ewvr ;
Beiscawen ;
and Bryn Gwyddon.¹

This the author quotes as among the ‘Triads of the Bards—the Triads of Privilege and Usage,’ from the book of Llywelyn Sion. Sion was born about 1516 and died about one hundred years later ; he had access to the Welsh MSS. of the earl of Pembroke, stored in Raglan Castle, which were destroyed during the wars of the Commonwealth, and he is supposed to have compiled his book from these. There is no certainty that he did not compose the triad himself, but its topographical character makes this unlikely, and without doubt this reference to Boscawen-ûn is not later than the sixteenth century, probably much earlier. Gorsedd means ‘a great seat,’ or ‘a session,’ such as is held by the bards before an eisteddfod to declare it open, and the use of the word here implies that Boscawen-ûn was a traditional meeting place for secular or religious ceremonies, perhaps both. We find ourselves on firmer ground when we read what William Camden had to say about it in 1586² : ‘In the neighbourhood of this [Buryan], in a place which they call Biscawe Woune, are to be seen nineteen stones arranged in a circle, every one about twelve feet distant from another, and in the centre rises one much larger than all the rest.’ It is evident that there can have been little change in the circle for 300 years at least. Dr. Borlase’s drawing (1754)³ shows eighteen stones standing in the ring, and one fallen. Britton and Brayley (1801) notice it, but inaccurately : ‘Another of these Druidical circles is named *Boscawen-Un*. This also consists of nineteen upright stones, and is about twenty-five feet [? yards] in diameter, having a single leaning stone in the centre.’⁴ William Cotton⁵ gives an excellent plan of the circle, but curiously enough substitutes north for east ; he shows a hedge crossing it, occupying the present gap between Nos. 15 and 16 and enclosing

¹ Tair Priforsedd Beirdd Ynys Prydain,

Gorsedd Moel Meriw,—
Gorsedd Beisgawen,—
a Gorsedd Bryn Gwyddon. } or {

Moel Efwr
Beisgawen
a Bryn Gwyddon.—*Barddas* (1862), ii. 76–7.

² ‘In huius vicinia in loco, quem Biscawe Woune dicunt, vnde viginti lapides in orbem dispositi conspiciuntur, singuli xii quasi pedibus inuicem distantes, & in centro cæteris omnibus multo maior exsurgit’ (*Britannia*, p. 72).

³ *Antiquities of Cornwall*, pl. xiii.

⁴ *Beauties of England and Wales*, ii. 496.

⁵ *Illustrations of Stone Circles, etc. in the West of Cornwall* (1826), pl. ii.

A HISTORY OF CORNWALL

No. 4 on the other side ; Nos. 7 and 2 have fallen, and a large flat stone lies outside the position now occupied by two halves. This hedge was noted by other writers, but about 1862 the landowner, Miss Elizabeth Carne, had it removed, the fallen stones replaced, and a hedge built round the ring to protect it. At the same time she caused a trench to be cut through the circle, but nothing was found to throw light on its origin, and the circle is as this lady left it, a model for landowners who stand possessed of such monuments.

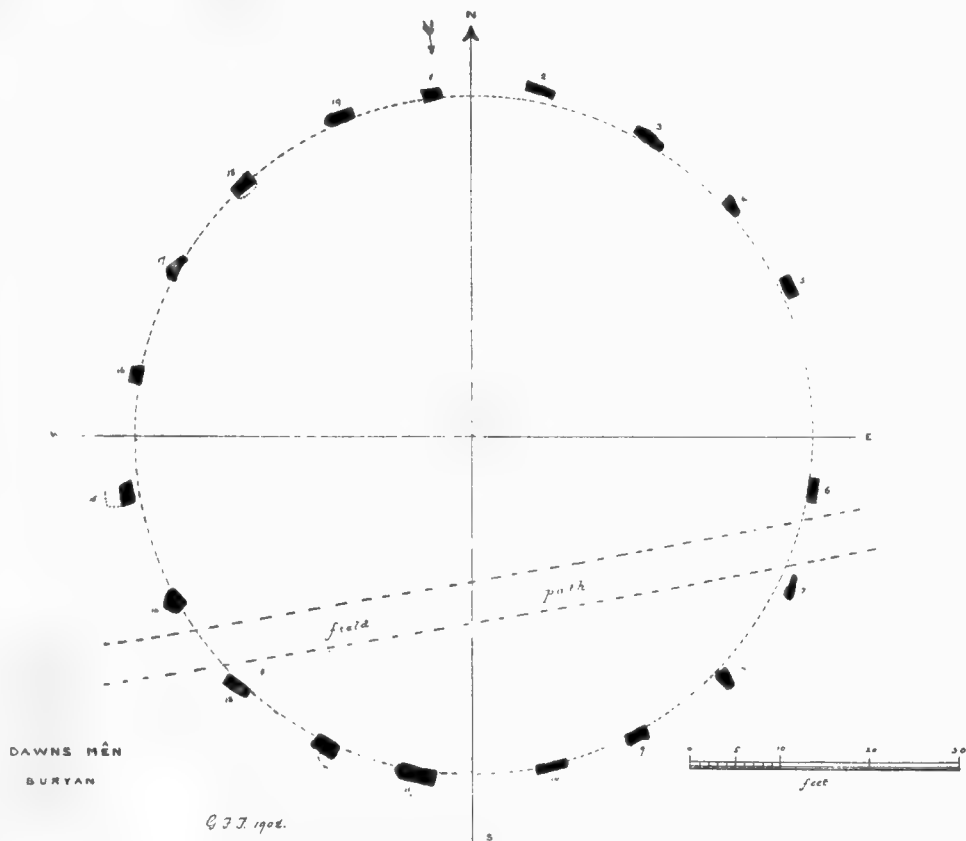
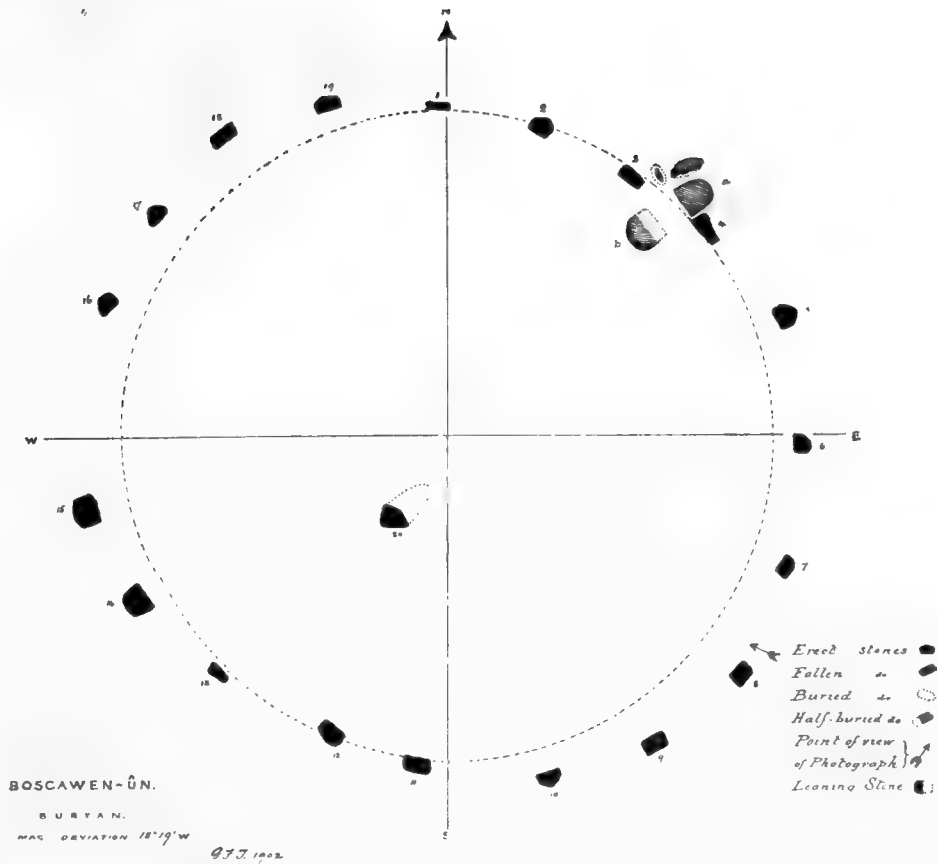
DAWNS MÊN

| No. | Remarks | Height | Breadth | Thickness | No. | Remarks | Height | Breadth | Thickness |
|-----|----------------------|---------|---------|-----------|-----|-----------|---------|---------|-----------|
| | | ft. in. | ft. in. | ft. in. | | | ft. in. | ft. in. | ft. in. |
| 1 | | 3 4 | 2 0 | 1 3 | 11 | wide | 3 7 | 4 0 | 1 8 |
| 2 | | 3 2 | 3 2 | 0 11 | | at base | | | |
| 3 | | 4 1 | 3 7 | 0 10 | 12 | | 4 0 | 2 8 | 1 8 |
| 4 | | 3 5 | 2 8 | 1 3 | 13 | | 4 4 | 2 8 | 1 0 |
| 5 | | 3 11 | 2 4 | 1 6 | 14 | | 4 6 | 2 3 | 1 7 |
| 6 | | 3 7 | 2 5 | 1 1 | 15 | leans out | 4 4 | 2 0 | 1 8 |
| 7 | shaped like cross | 3 5 | 2 5 | 0 11 | 16 | | 3 11 | 1 11 | 1 1 |
| 8 | | 4 1 | 1 9 | 2 2 | 17 | | 3 6 | 3 0 | 0 9 |
| 9 | | 4 6 | 2 7 | 1 5 | 18 | leans in | 2 10 | 3 0 | 1 0 |
| 10 | | 4 3 | 3 6 | 1 0 | 19 | | 3 4 | 3 5 | 0 8 |

South of Boscawen-ûn and in the same parish is the circle called Dawns Mên, which has some features in common with the other. It is situated on Rosemoddress farm, near to the hamlet of Boleit and 5 miles south-west of Penzance. The road makes a détour here, and a field-path, a short cut, crosses the grass field in which is the circle and passes through the circle itself.

The diameter is 76 ft. and, as will be seen by the plan, the circle is nearly exact, though the spacing is rather irregular ; here also we find a gap wide enough to hold another stone, but on the east side. The stones are of granite, very uniform in size, and none exceeding 4 ft. 6 in. in height ; there is no centre stone ; one stone has been rudely hewn, probably at a later date, into a shape resembling one of the round-headed crosses so plentiful in the parish.

The surroundings of a circle are important contributions to the consideration of its history, and the neighbourhood of this one is singularly rich in prehistoric remains. Two large menhirs, known as the ' Pipers,' stand at distances of 350 and 450 yards in a north-easterly direction (N. 40° E.), but probably were at no time visible from the circle, even without hedges. Sketches of these stones are given ; they are 13 ft. 6 in. and 15 ft. high, both are of granite and are much splintered and weather beaten. Another menhir stands 350 yards away on the south-south-east (S. 81° W.) in a cultivated field, formerly a piece of moorland called the Gûn Rith ; this menhir is of granite also, and 10 ft. 6 in. high. W.C. Borlase caused excavations to be made at the bases of these three, but



PLANS OF BOSCAWEN-ÔN AND DAWNS MÊN.

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STONE CIRCLES

found nothing at the feet of the 'Pipers' and only a beach pebble, 'flattened on one side by being used as a rubber,' near the Gûn Rith menhir. The presumption, as far as it is safe to presume at all on such negative evidence, is that they were ceremonial rather than sepulchral. Associated with this circle also were three holed stones, two in a lane and one in the road.¹ That in the road remains, doing duty as a gate-post, but the other two are no longer to be seen. What the object of these holed stones may have been is an unsolved problem, though Dr. Borlase thought they were used to tie the victim of human sacrifice to, and the late R. N. Worth explained the holes as intended to hold a fence rail.² There are several barrows near, more or less ruined, and barrows were, in days gone by, a decided feature of the vicinity.

The name, spelt variously as Dawns Mên, Dans Maen, Dawns Maen, Dance Meyns, Dance Maine, and Dawns Myin, means 'stone dance,' and though specially appropriated to this circle has been applied



to several others. The local legend is that nineteen maidens, dancing on the Sunday to the music of two pipers, were turned into stones as a judgment for desecration of the day, while the gigantic pipers succeeded in escaping to a distance before the same fate overtook them. This story is told of many other circles, and it is an interesting instance of the wide diffusion of the same idea that at Wulfsbrüchen, in the Neumark, Germany, is, or was, a circle called 'Adam's Dance,' or the 'Stone Dance,' which has two somewhat taller stones outside the ring, said to have been the musicians, and to which a very similar legend is attached.³ Near Boitin, in Mecklenburg, is a group of three circles known as the *Steintanz*, attributed to certain peasants, who, making merry at a wedding, danced upon cheeses and were turned to stone.⁴

Tradition says that Athelstan fought a battle with the native Cornish at Boleit, in the year 936, and it may be that the name Gûn

¹ J. T. Blight, 'Holed Stones,' *Arch. Camb.* (1864), x. 292-9.

² *Journ. Roy. Inst. of Cornwall* (1894), xii. pt. 2, 199.

³ W. C. Borlase, *Dolmens of Ireland* (1897), ii. 533.

⁴ *Ibid.* p. 502.

A HISTORY OF CORNWALL

Rith (red down) preserves the memory of a bloody conflict. The first authentic reference to Dawns Mên is but a late one, that of William Hals (1685-1736), and he, with his usual inaccuracy, probably confounds it with Boscawen-ûn, when he talks of a centre stone. Dr. Borlase (1754)¹ noted nineteen stones, but says nothing of a central one; Britton and Brayley (1801)² mention the same number; but by 1827 the circle had experienced reverses, for William Cotton records sixteen stones standing and two fallen;³ he must have overlooked one, since Richard Edmunds, in 1850, speaks of three out of nineteen stones being prostrate.⁴ Lukis and Borlase give a plan and description of the circle, and remark that the proprietor, Lord Falmouth, had restored to the ring a stone which had been removed.⁵ Certainly the circle has been well taken care of and is in very perfect condition now.

Both at Boscawen-ûn and Dawns Mên there exists a gap in the periphery wide enough to take another stone, and yet our earliest records only mention nineteen stones. The Dartmoor Exploration Committee were met by the same problem at Whitemoorstone Down, where the circle has nineteen stones and a gap, in this case on the north side. Their Report says that they removed the turf and searched the sub-soil for the socket, or pit-hole, of another stone; but having failed to find any they concluded that the gap was intentional.⁶ No such search has been made in these Cornish circles, and if made it might be inconclusive, since Dawns Mên at least has been ploughed and the hedge at Boscawen-ûn passed through the gap itself; ploughing however is unlikely to go deeper than a foot and would not in that case destroy traces of a missing stone. It may be urged that there is a lack of uniformity in the position of these gaps, but we find the same in the well-marked entrances of the Cumbrian circles.

TREGASEAL

| No. | Height | Length | Breadth | Thickness | No. | Height | Length | Breadth | Thickness |
|-----|---------|---------|---------|-----------|-----|------------------|----------|---------|-----------|
| | ft. in. | ft. in. | ft. in. | ft. in. | | ft. in. | ft. in. | ft. in. | ft. in. |
| 1 | 3 3 | — | 1 8 | 1 6 | 16 | against hedge | 5 9 | 2 9 | — |
| 3 | 2 10 | — | 2 0 | 1 0 | 17 | 3 10 | in hedge | 3 0 | — |
| 4 | 3 1 | — | 1 10 | 0 9 | 21 | 3 0 | — | 2 0 | 1 0 |
| 5 | 2 9 | — | 1 4 | 0 10 | 22 | 2 7 | — | 2 6 | 1 4 |
| 6 | 3 0 | — | 1 9 | 1 6 | 24 | 3 9 | — | 2 6 | — |
| 7 | 3 7 | — | 2 0 | 1 1 | a | enclosure | 4 0 | 1 8 | — |
| 8 | 3 10 | — | 2 0 | 1 1 | b | " | 2 0 | 1 6 | — |
| 9 | fallen | 4 7 | 2 1 | — | c | " | 3 8 | 2 9 | — |
| 10 | " | 5 7 | 2 3 | — | d | " | 2 9 | 2 4 | — |
| 11 | " | 5 4 | 1 2 | — | e | " | 2 6 | 2 3 | — |
| 12 | " | 3 3 | 2 0 | — | f | " | 3 0 | 2 3 | — |
| 14 | " | 4 6 | 0 7 | — | | | | | |

¹ *Ant. of Cornw.*, (ed. 1), pp. 169, 170, 183.

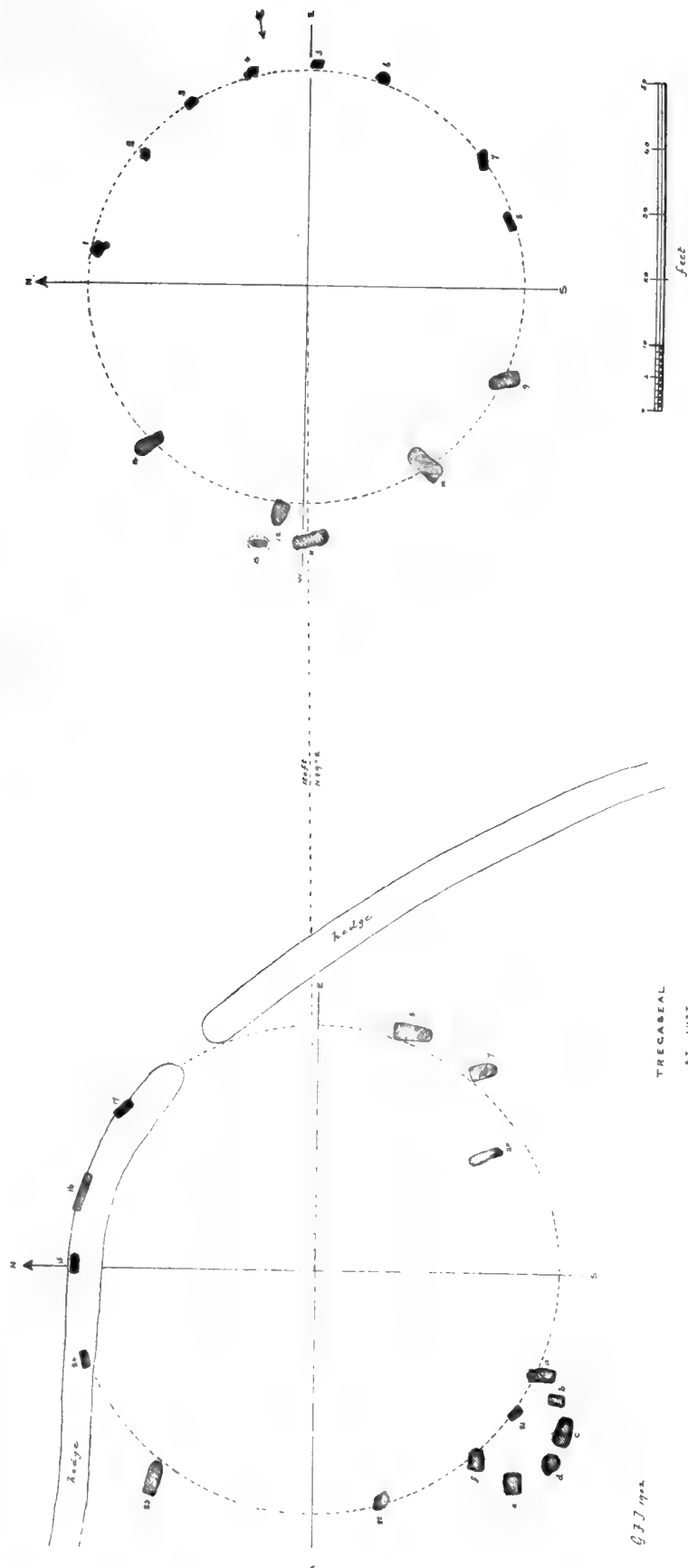
² *Beauties of England and Wales*, ii. 496.

³ *Illustrations of Stone Circles*, pp. 21-2, pl. i.

⁴ *Trans. Penzance Nat. Hist. and Antiq. Soc.* old ser. i. 381-2.

⁵ *Prehistoric Monuments*, pp. 1, 21, pl. i.

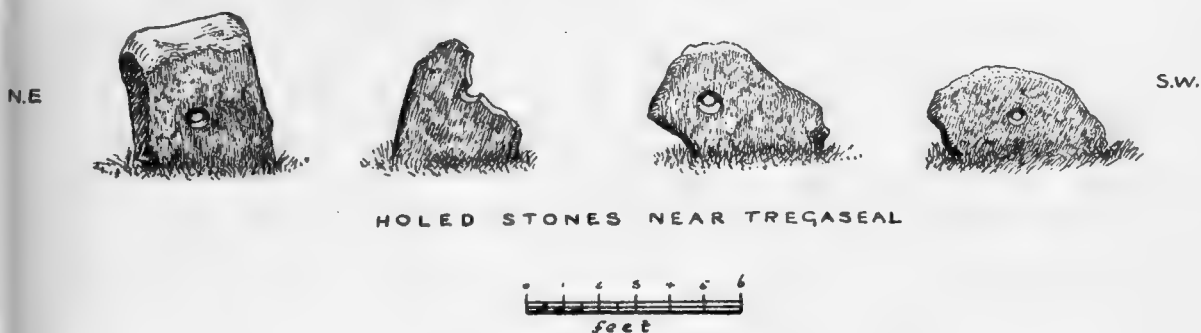
⁶ *Report of Devonshire Association* (1896), pp. 182-3; (1897) pp. 147-8.



PLANS OF TREGASEAL.

STONE CIRCLES

Two circles are situated about a mile from St. Just-in-Penwith, on the southern slope of the rough and boulder-strewn Carn Kenidjack. They lie east and west of each other, their supposed centres 150 ft. apart, and are divided by a hedge, into which are built some stones of the western circle. The eastern circle stands on the common and is the more perfect of the two, though, owing to its incomplete condition, we can only state its diameter as *about* 66 ft. 6 in. ; thirteen stones remain out of nineteen or twenty, seven of them standing and six fallen ; the largest is only 4 ft. high. All are of granite, hewn no doubt from the blocks with which the moor is strewn. The condition of this circle is unsatisfactory, but that of the western one is worse. Its probable diameter is 74 ft. ; five stones only remain erect, and of these three are built into the aforesaid hedge ; five are prostrate, one being split, and to make the confusion worse many granite blocks, cleared from the field, have been thrown in among the fallen stones of the circle. A group of unshaped boulder-like stones forms a semicircle round No. 21 in the plan, and beyond this again is a cairn of small stones, not apparently connected with the circle. W. Cotton shows this enclosure in his plan



HOLED STONES NEAR TREGASEAL

(1826), and the Rev. John Buller also depicted it sixteen years later. The object of this enclosure must be more or less conjectural, but we find a structure rather like it within the ring of Keswick Circle, on the east side ; of the Keswick example 'nothing remains,' says Mr. Dymond, 'to show for what purpose this chamber was constructed,'¹ but later investigation suggests a sepulchral origin.

Rather more than a quarter of a mile away, in a north-easterly direction, there stand by the side of the footpath leading to the North St. Just road four holed stones, sketches of which are here given. There is no apparent connexion between these stones and the circles, but as there were three holed stones at Dawns Mên these particular examples should also be mentioned. They have been described and figured by J. T. Blight² and by Lukis and Borlase.³ W. C. Lukis remarks : 'From their arrangement in a line north-east and south-west I conclude that they all formed together one monument' ; while R. N. Worth suggests that the monument was a prosaic fence rail, hardly taking into account

¹ *Journ. Brit. Arch. Ass.* March, 1878.

² *Arch. Camb.* (1864), loc. cit.

³ *Prehistoric Monuments*, pp. 17, 27, and pl. xxxiii.

A HISTORY OF CORNWALL

how near it would be to the ground and the fact of the holes being *splayed*. It may be fairly stated that we do not know the object of this arrangement of stones. The fifth stone, which formerly stood 100 yards farther on, is not now to be seen. In the same direction, north-east, there stands on Longstone Down, Boslow, a tall menhir, 9 ft. high, the top of which is just visible over the hedge from the circles. This is the third instance of a menhir, or menhirs, being found near circles in West Cornwall. Here as elsewhere the moor is dotted with barrows, and from one of them the late W. C. Borlase obtained the very fine urn now in the British Museum and known as the 'Tregaseal urn.'

We are indebted to Dr. Borlase for an early mention of these circles; in his MS. Parochial Memoirs (1738) he says: 'On Tregaseal-downs are two circles of stones placed on end, standing east and west of each other. In the eastern, 17 stones are still standing, two prostrate, one broken off. Diameter, 23 paces. In the western, 10 standing, four prostrate, about 26 paces diameter, called Tregaseal Dancing Stones.'¹ In the 164 years covered by the various plans and descriptions there has been a steady deterioration of this interesting monument.

It may be noted that these circles lie east and west of each other, with the small error of 1° or 2° between their centres. The Scilly Isles are plainly visible west-south-west. Other instances of two circles side by side are found in the Grey Wethers, Dartmoor, and the Wendron Circles.

BOSKEDNAN

| No. | Height | Length | Breadth | Thickness | No. | Height | Length | Breadth | Thickness |
|-----|----------------------|-------------|---------|-----------|-----|------------------|-------------------|---------|-----------|
| | ft. in. | ft. in. | ft. in. | ft. in. | | ft. in. | ft. in. | ft. in. | ft. in. |
| 1 | 4 0 | leans out | 3 1 | 1 6 | 7 | fallen | 4 6 | 2 3 | — |
| 2 | leans out, nearly | 5 6 down | 1 9 | 1 8 | 8 | 4 8 | — | 1 6 | 1 8 |
| | | | | | 9 | fallen | 7 6 | 2 6 | — |
| | | | | | 10 | 6 4 | — | 2 1 | 1 6 |
| 3 | 3 10 | — | 1 6 | 2 3 | 11 | down, covered | 6 0 with furze | 1 9 | — |
| 4 | 3 9 | leans out | 3 10 | 1 2 | | | | | |
| 5 | 3 9 | ditto | 2 5 | 1 0 | | | | | |
| 6 | leans in, nearly | 4 7 down | 2 0 | 0 10 | | | | | |

Boskednan Circle is in the parish of Gulval and lies about $4\frac{1}{2}$ miles north of Penzance, on the high moorland between Ding Dong Mine and Carn Galva; it takes its name from the farm near by, and the land-owner is Mr. T. Robins Bolitho. The diameter is 69 feet, which is about the average for West Cornwall, but most of the stones are above that average in size. The largest stone, a fallen one (9), is 7 ft. 6 in. long; one end of it can be seen in the foreground of the photograph; another (10) stands 6ft. 4in. out of the ground, and a third (11), pros-

¹ *Prehistoric Monuments*, 2.



R. H. Preston]

[Penzance

TREGASEAL,
From the East.



Gibson & Sons]

[Penzance

BOSKEDNAN,
From the North-west.

To face page 386.

STONE CIRCLES

trate and covered with furze, is 6 ft. long : this group of large stones is on the north side of the circle. Eleven stones remain altogether, six standing and five fallen, so that this venerable monument presents a rather dilapidated appearance. The stones are of granite, the moor-stone of the immediate neighbourhood, for the circle-builders of Cornwall certainly laboured under few disabilities in the supply of material, though they hardly availed themselves to the full of their advantages.

An unusual feature of this circle is the small barrow, 36 ft. in diameter, which stands on the south of it and has overflowed and invaded a portion of the circumference. This is the only example in Cornwall of a barrow so placed, for as a rule they are at a respectful, nay a considerable, distance from the circle. A somewhat similar instance is found at Arbor Low in Derbyshire, where a tumulus has been constructed in the bank which surrounds the circle ; this is regarded as a secondary structure and not contemporaneous, and in all probability the barrow at Boskednan is also much later than the circle. J. T. Blight tells us, on the authority of a credible person in the neighbourhood of Penzance, that about fifty years ago labourers opened this barrow and found some urns.¹ W. C. Borlase in 1872 'caused a trench to be dug across it and the four side-stones of a Kist-Vaen were soon discovered. . . . The cover had been unfortunately removed, and the chamber rifled. Continuing the trench in a westerly direction, the workmen discovered, at a distance of two feet from the Kist-Vaen, a large quantity of burnt wood ; and two feet further still, the fragments of an urn, formed of very coarse clay.'² The kist has suffered injury since Mr. Borlase examined it, and only the two side stones remain *in situ*.

Two other cairns are to be seen near by, one 100 yards away north-west, and a large but dilapidated one 200 yards east of the circle. There is an earth-fast stone on the north-west, which looks like the base of a broken menhir, and on Watch Croft, west-north-west, is a menhir 6 ft. 3 in. high. The Mên-an-Tol and the Mên Scryfa are in sight, but hardly distinguishable on the grey moor, and Mulfra Quoit can be seen on the hill to the eastward (N. 80° E.). The moors here fairly bristle with the relics of a forgotten social order, with huts, barrows, menhirs, hill-castles, cliff-castles, dolmens ; but there is no evidence that any of these remains stood in a definite relation to the circle ; even the barrow touching the ring gives the impression, after examination on the spot, that it is a late intrusion and not part of the original design.

Dr. Borlase gives a sketch of this circle, showing nineteen stones in the periphery, thirteen of which are standing and six fallen.³ Judging by the spacing of the stones that remain the original number would have been twenty-one or two—unless we allow for a gap here, as at Boscawen-ûn and Dawns Mên. W. Cotton's plan of 1826

¹ 'Notes on Stone Circles,' *Gent. Mag.* (1868), pt. i. pp. 308-19.

² *Nenia Cornubiæ*, 281.

³ *Ant. of Cornw.*, pl. xiii.

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shows the same stones standing then as now ; but of the nine stones then prostrate five have disappeared.

WENDRON

| No. | Remarks | Height | Breadth | Thickness | No. | Remarks | Height | Breadth | Thickness |
|-----|----------|---------|---------|-----------|-----|----------|---------|---------|-----------|
| | | ft. in. | ft. in. | ft. in. | | | ft. in. | ft. in. | ft. in. |
| 1 | leans in | 3 4 | 2 1 | 1 3 | 6 | in hedge | 5 0 | 1 10 | — |
| 2 | | 3 5 | 2 6 | 1 4 | 7 | „ | 4 0 | 2 8 | — |
| 3 | | 3 6 | 2 2 | 1 4 | 8 | „ | 3 10 | 2 3 | — |
| 4 | | 3 0 | 2 6 | 1 7 | | | | | |
| 5 | | 3 8 | 3 7 | 1 1 | | | | | |

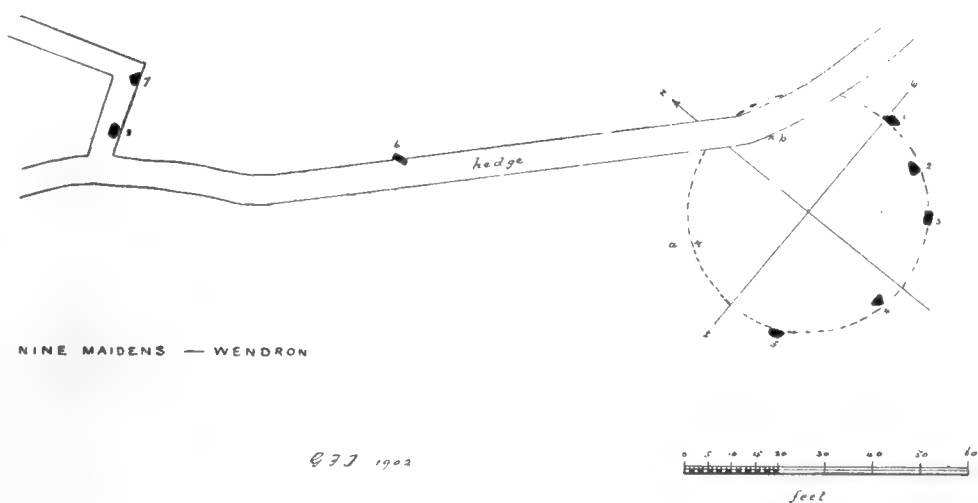
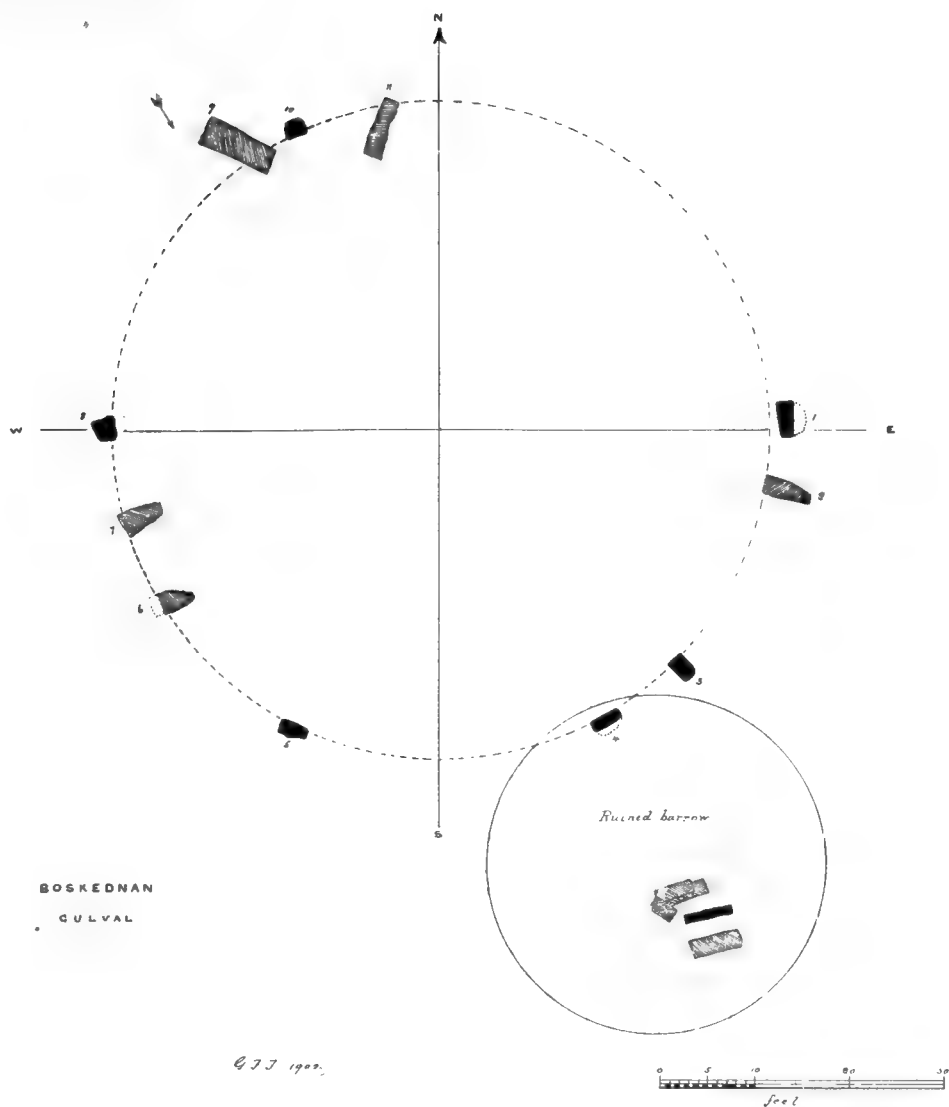
Four miles south of Redruth, on the road to Helston, is a piece of waste land called Nine Maidens Downs, and at the southern end of this in a grass field, close to two cottages, are the remains of two circles, known locally as the Nine Maidens. They are situated in Wendron parish, and as 'Nine Maidens' is a generic term they are usually distinguished by the name of the Wendron Circles. Five stones remain in the southern and smaller circle and only three in the other. The southern circle probably had a diameter of 51 ft. and consisted of about fourteen stones ; those that remain are of granite and well cut, though the largest is only 3 ft. 8 in. high. Another stone once stood at the point marked (a) in plan E ; it was subsequently removed to (b), and has now disappeared. A hedge crosses this circle, but there do not appear to be any more stones in the hedge or on the north side of it, in land formerly waste, but now enclosed and cultivated. The northern circle is represented by three stones built into hedges, but in Dr. Borlase's day there were ten of them ; it was perhaps 60 ft. in diameter.

Dr. Borlase's account is contained in his MS. Parochial Memoirs (1738) quoted by Lukis and Borlase.¹ He tells us that there were 'two incomplete Circles of stones erect, the southernmost having 8 large stones from 4 to 7 feet high still standing ; one or two gone ; the other larger in circumference, having 10 stones still to be seen, two of which are large and tall ; most of the rest fallen.' Hals is quaint and inaccurate as usual. He says : 'In another part of this parish, by the post road, or highway, are set up, in perpendicular manner, about ten feet asunder in a line, nine large moor stones commonly called the Nine Maids, or Virgin Sisters ; probably set up in memory of so many sister nuns heretofore interred there.'² Lukis and Borlase give plan, sketches and description of these monuments.

There are no menhirs near to or visible from this place ; a barrow stood 20 or 30 yards to the west and another is to be seen on a hill, called Hangman's Barrow, about 1,000 yards in the same direction.

¹ *Prehistoric Monuments*, 29.

² D. Gilbert, *Paroch. Hist. of Cornwall* (1838), ii. 137.



PLANS OF BOSKEDNAN AND NINE MAIDENS.

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STONE CIRCLES

The five circles in the hundred of West Penwith lie, as we have seen, close together in a district strewn with megalithic remains, and it might be assumed that other moorland districts would also yield examples of this class of monument, but here, in the Carnmenellis region, the Wendron Circles stand alone; the neighbourhood of Carn Brea is without one, also the wide stretch of moor north of St. Austell, and no other is found till we get 10 miles east of Bodmin.

TRIPPET STONES

| No. | Height | Length | Breadth | Thickness | No. | Height | Length | Breadth | Thickness |
|-----|---------|----------|---------|-----------|-----|------------|---------|---------|-----------|
| | ft. in. | ft. in. | ft. in. | ft. in. | | ft. in. | ft. in. | ft. in. | ft. in. |
| 1 | 4 9 | leans in | 1 3 | 1 4 | 7 | 4 4 | — | 3 9 | 1 0 |
| 2 | fallen | 5 11 | 2 3 | — | 8 | 4 7 | — | 2 0 | 1 0 |
| 3 | 4 9 | — | 3 5 | 0 7 | 9 | broken off | — | 4 0 | — |
| 4 | fallen | 6 9 | 2 0 | — | 10 | 5 2 | — | 1 10 | 1 2 |
| 5 | 4 4 | — | 1 9 | 1 1 | 11 | fallen | 5 6 | 1 10 | — |
| 6 | 5 0 | — | 1 6 | 1 4 | 12 | 4 9 | — | 4 3 | 1 3 |

Trippet Stones is the name of a circle standing on Blisland Manor Downs, Bodmin moors, close to the road from Temple to Bradford Bridge; it is in Blisland parish, and the landowner is Mrs. Collins of Blisland Manor House. The diameter is 103 ft.; twelve stones remain out of a possible twenty-six and of these eight only are erect, but the cattle have so worn away the turf and soil round the base of the standing stones that it is to be feared that others will shortly fall, a danger threatening nearly every circle on these moors. The stones are of granite and rather larger than the type prevailing in West Cornwall; indeed this circle approximates in character to those of Dartmoor. One stone (9) has been broken, and the largest which remains standing (10) measures 5 ft. 2 in. out of the ground.

There is nothing specially noticeable about the position of the circle, unless it be supposed to have some relation to Stripples Stones, visible across the moor (N. 79° E.), while the Cheesewring on Carbilly Tor makes a conspicuous object on the north-west (N. 57° W.).

The name—Trippet Stones—has no reference to any farm near, but is probably descriptive; in all probability also it is English and not Celtic in its origin. None of the early county historians have mentioned this or any other circle on the Bodmin moors, and it appears that the late J. T. Blight was the first to call attention to it; he gives a sketch and says that nine stones were standing in 1858, the date of his book.¹ Sir John Maclean refers to it (1873),² and Lukis and Borlase (1885) give a plan and sketches of the stones, one of which (11) has fallen since their day.³

¹ *Ancient Crosses, etc., in East Cornwall*, 131.

² *Hist. of the Deanery of Trigg Minor*, i. 24.

³ *Prehistoric Monuments*, pp. 3-30, pl. vii.

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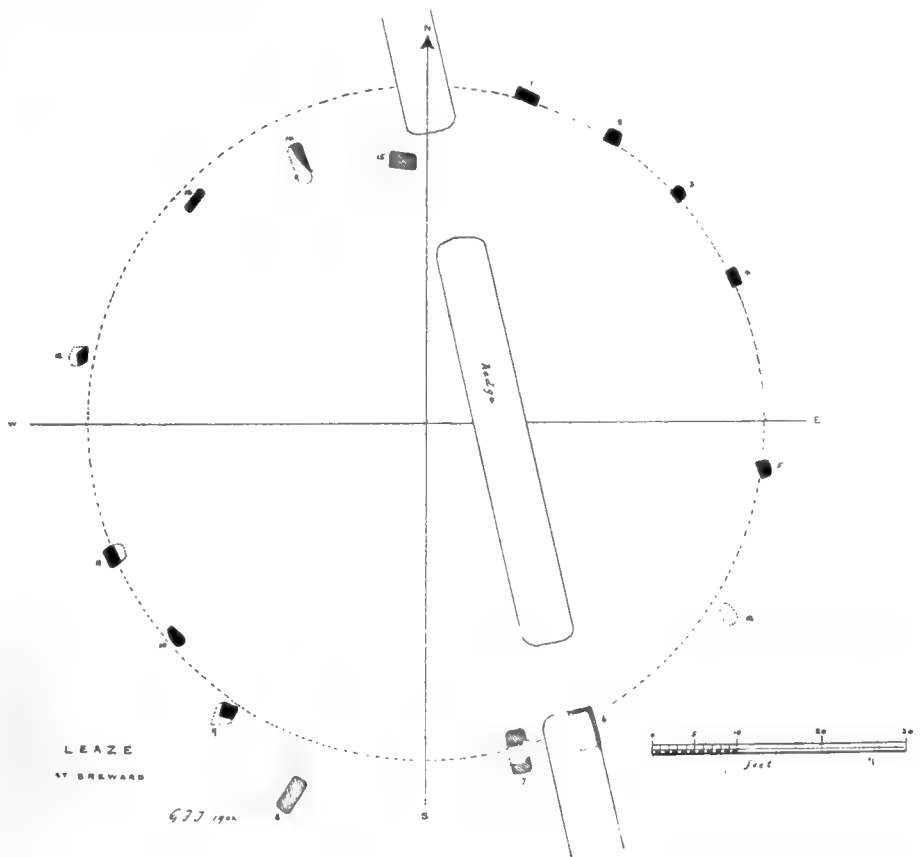
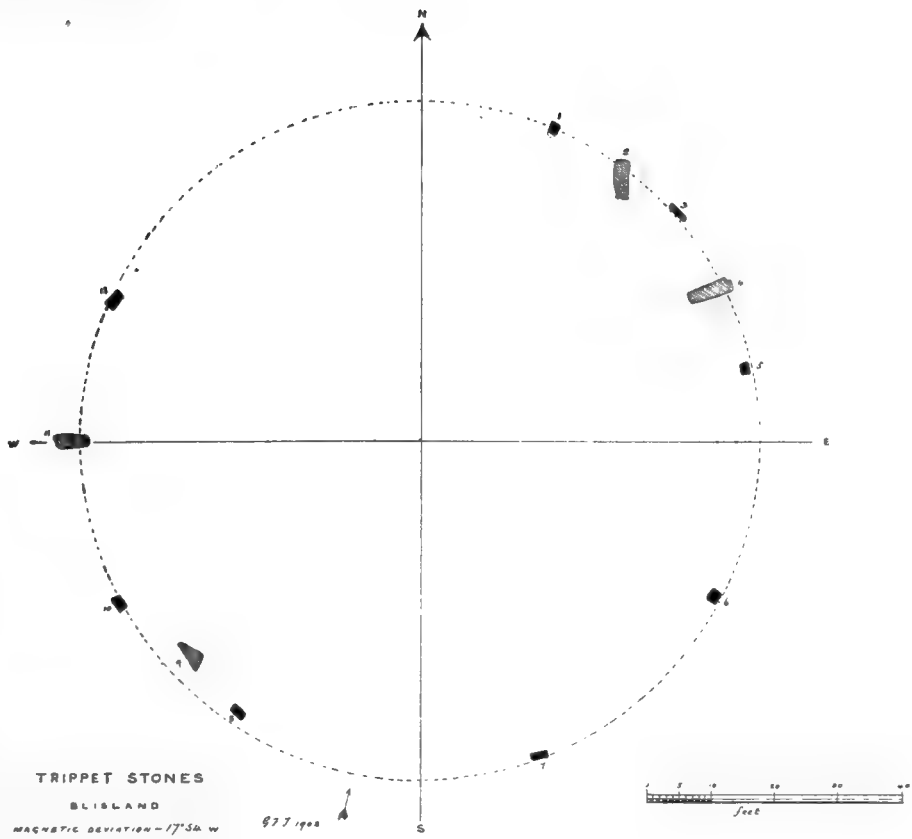
STRIPPLE STONES

| No. | Height | Length | Breadth | Thickness | No. | Height | Length | Breadth | Thickness |
|-----|------------------------|------------------|--------------|-----------|-----|--|-----------|---------|-----------|
| | ft. in. | ft. in. | ft. in. | ft. in. | | ft. in. | ft. in. | ft. in. | ft. in. |
| 1 | fallen, half buried | 10 0 in grass | 4 9 | — | 8 | fallen, half buried | 10 3 | 5 4 | — |
| 2 | 3 11 | leans in | 2 5 | 0 8 | 9 | 5 8 | leans out | 3 6 | 1 6 |
| 3 | on edge against | 6 0 hedge | 1 6 | 0 10 | 10 | fallen | 6 6 | 3 0 | — |
| 4 | split, portion | 6 6 against | 2 0 hedge | 0 10 | 11 | „ | 8 11 | 3 0 | — |
| 5 | buried stone | 8 0 | 3 9 | — | 12 | 6 8 | — | 4 0 | 0 11 |
| 6 | 4 10 | — | 2 9 | 0 11 | 13 | fallen | 9 6 | 1 8 | — |
| 7 | fallen, broken | 9 0 | 5 0 | — | 14 | „ | 9 1 | 2 11 | — |
| | | | | | 15 | „ | 6 10 | 4 0 | — |
| | | | | | 16 | fallen, buried | 6 10 | 2 11 | — |
| | | | | | 17 | fallen | 6 9 | 1 11 | — |
| | | | | | 18 | centre stone, fallen and broken | 13 3 | 4 2 | — |

(a and c) Buried fragments.

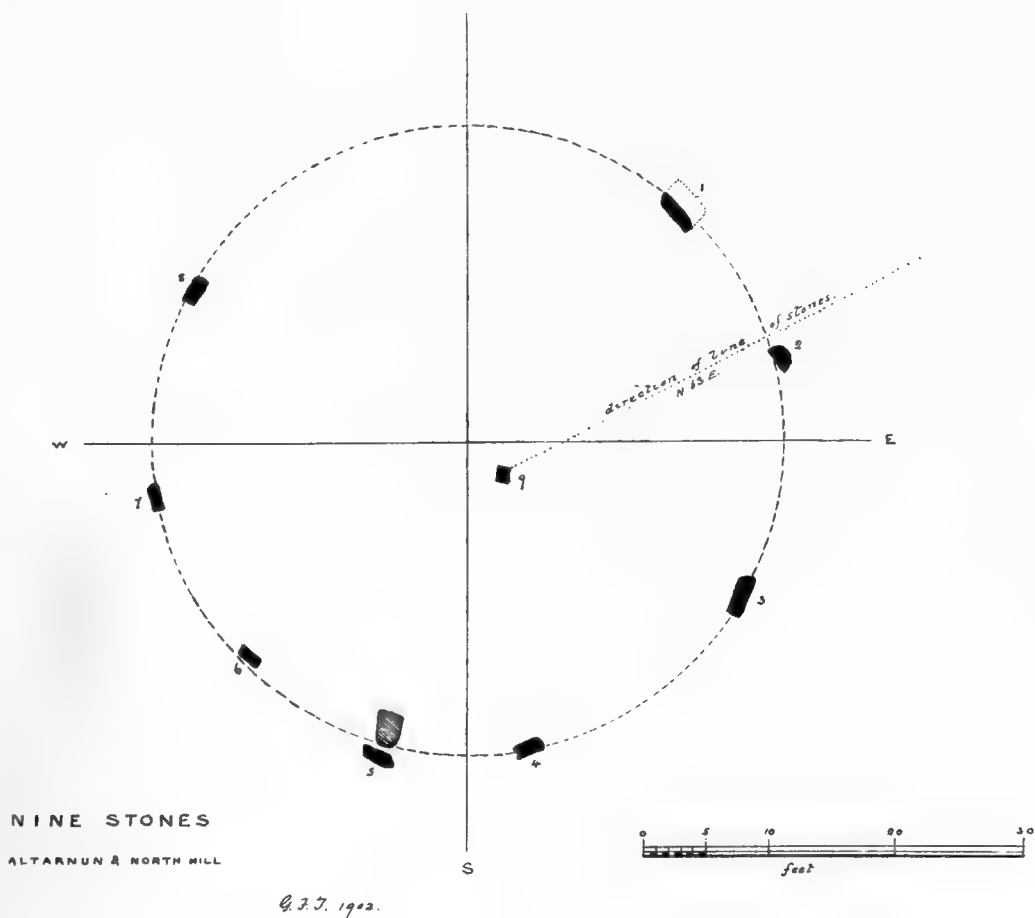
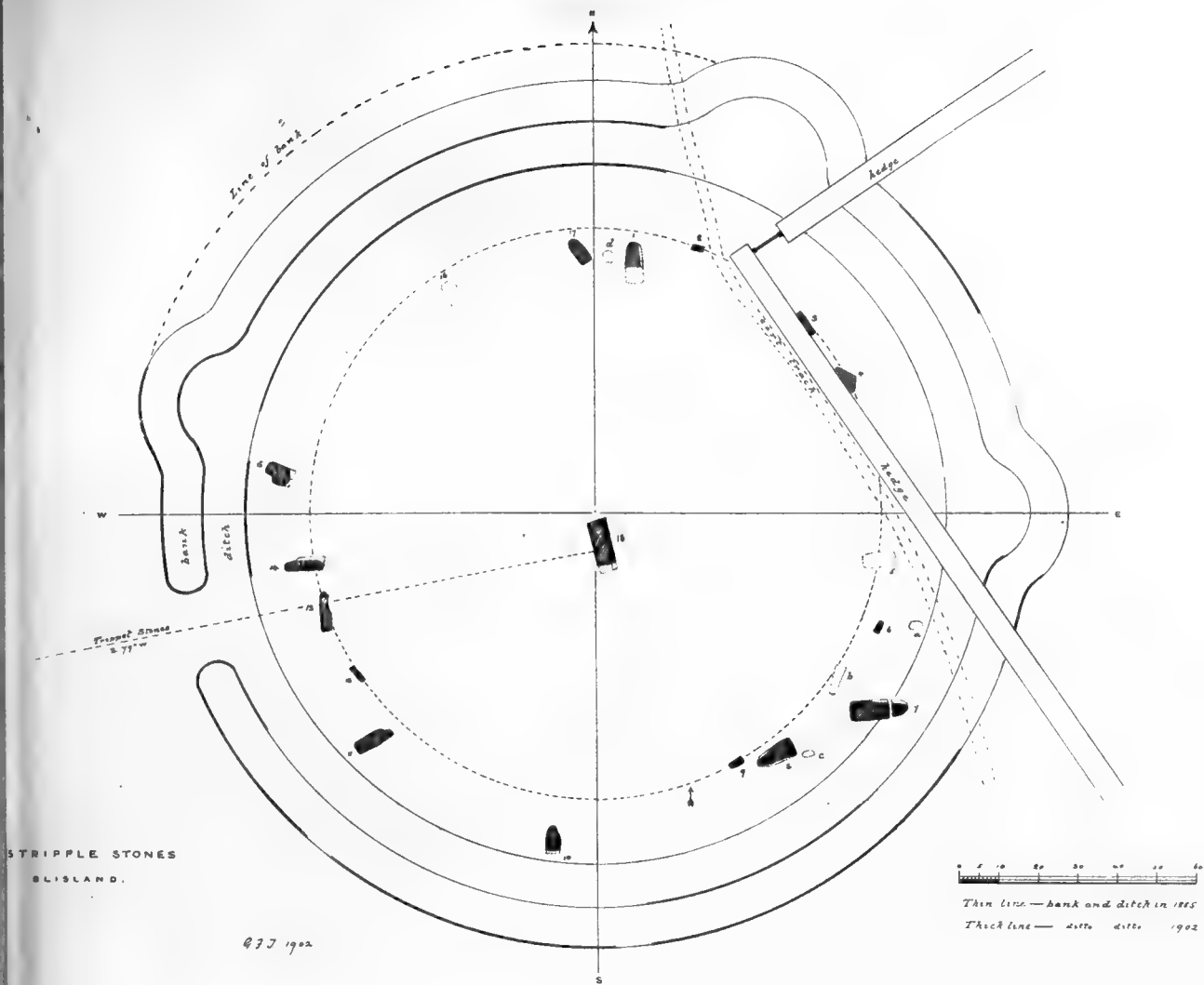
(b) Stone shown by Lukis and Borlase, now removed.

Stripple Stones, at once the finest and the most injured of our stone circles, stands on the south-eastern slope of Hawk's Tor, within sight of Trippet Stones. The parish is Blisland, and the landowner is Sir W. Onslow, bart. The striking feature of this monument is that it stands on a circular platform, 178 ft. in diameter, which again is surrounded by a ditch and bank, each about 10 ft. wide. Owing to the ruined state of the circumvallation these dimensions must be taken as approximate only. The surrounding bank expands at three points, as will be seen by the plan, into curved extensions or 'demilunes,' the one on the west side being still clearly distinguishable, while the other two have all but disappeared; an entrance is cut through the bank on the west in the direction of Trippet Stones. The whole structure, as depicted by Lukis and Borlase in 1885, is faintly outlined in this plan, and the thicker lines show such portions of it as could be distinguished in 1902. Time, exposure, the feet of cattle, and neglect have all done their worst, but the crowning injury is the work of the landowner, who has erected a hedge cutting off a segment of the circle itself and obliterating much of the earthwork; this hedge was made about the year 1885. On the platform stood a circle about 145 ft. in diameter, mostly of large stones and perhaps numbering originally about twenty-eight, with a tall and massive central monolith. Now four stones remain standing, twelve (including the central one) are prostrate, two are buried, and there are some buried fragments. One fallen stone (b), shown by Lukis and Borlase, has been taken away, and two others lean against the new-take hedge; No. 7 has been broken, probably by its fall; No. 15 has fallen since the date of Lukis and Borlase's visit, and the massive central stone has had a slice cut out of it, most likely to make a gatepost. All the stones are of granite, and the table of dimensions will show that they are large, and that the average



PLANS OF TRIPPET STONES AT BLISLAND AND LEAZE.

To face page 39c.



PLANS OF STRIPPLE STONES AT BLISLAND AND NINE STONES AT ALTARNUN.

STONE CIRCLES

size is above that of any other circle in the county. Only one other circle in Cornwall has a central stone of undoubted antiquity, viz. Boscawen-ûn, and the possession of such a central monolith marks them out as of exceptional importance, which appears to have been the case, since one is mentioned in a Welsh triad and the other has this elaborate and unique circumvallation. The earthwork seems of too slight a character for defensive purposes and it is likely that here, as at Stonehenge, the bank was intended as an enclosure—it may be a sacred enclosure—giving a finish to the monument. The entrance (S. 79° W.) is clearly marked, and was perhaps designed to admit processions of some sort; its choice of direction, towards Trippet Stones, may have been more than accidental. The ditch and bank, or the ditch alone, is a not uncommon adjunct to some of the larger and more important stone circles. Stonehenge, as already mentioned, has a ditch and bank, with an entrance on the north-east; Avebury circle has a deep ditch and high bank; Arbor Low has a considerable entrenchment round it and entrances on the south-east and north-west; the Ring of Brogar, Orkney, has a ditch crossed by two causeways.

There are no menhirs to be seen near, but in the ploughed field on the east is a kist-vaen, 5 ft. long by 3 ft. wide, which was once enclosed in a barrow 24 ft. in diameter. The position of this circle is remarkable; it is situated, as has been said, on the south-east slope of Hawk's Tor, and over the shoulder of that hill, due north, appears the top of Garrow Hill, 1,086 ft. high, while beyond and above that again, in the same line, shows the top of Row Tor, 1,311 ft. Between Garrow and Row Tor, in the northern line, but out of sight, is another circle called Fernacre. The accompanying photograph shows the position of these two hills, and in the foreground are a stone of the circle (No. 2) and the offending hedge.

Seeing that traditions cluster round Dawns Mên and that Boscawen-ûn is credited with being the site of some Celtic festival, it is disappointing that no legend is attached to this more striking monument. An early reference indeed there is, but it throws no light on the history of Stripples Stones. In 1599 Nicholas Boscawen brought an action against Manner Hill and Nicholas Burnard for trespass on Her Majesty's manor of Bliston, alias Blisland, and one of the witnesses, John Burnard, being interrogated at Bodmin as to certain boundaries, deposed that the boundary line ran 'to tynne pytt, and from thence to Strypple Stones, and from thence a thwarte into the Torre called Hauxtorre.'¹ All we learn from this is that three hundred years ago it was known by the same name, spelt differently. It is probably owing to the isolation and desolation of these moors that Stripples Stones has been passed over by nearly all the writers who have described the beauties and antiquities of Cornwall. Sir John Maclean mentions it as having five stones erect,² and Lukis and Borlase include in their

¹ Exchequer Depositions, 41 Eliz. Mich. 3.

² *Hist. of Trigg Minor*, i. 24.

A HISTORY OF CORNWALL

handsome volume a plan, sketches and description,¹ though they overlooked some of the buried stones.

It is much to be regretted that this circle, which Mr. Lukis described as 'the most interesting and remarkable monument in the county,' should have been allowed to reach such a state of ruin and to run the risk of more complete dilapidation, since the stones now standing will certainly fall unless protected in time, and the outline of the bank will disappear. On the landowners must necessarily rest the responsibility for the neglect of the prehistoric monuments on their land, and it is to the landlords that the public looks for the protection of these relics of a dim past.

LEAZE

| No. | Height | Length | Breadth | Thickness | No. | Height | Length | Breadth | Thickness |
|-----|--------------------------------|-----------|---------|-----------|-----|---------|-----------|---------|-----------|
| | ft. in. | ft. in. | ft. in. | ft. in. | | ft. in. | ft. in. | ft. in. | ft. in. |
| 1 | 3 7 | — | 2 9 | 1 2 | 8 | fallen | 4 5 | 1 7 | 1 5 |
| 2 | 3 3 | — | 1 11 | 1 8 | 9 | 3 1 | leans out | 1 5 | 1 5 |
| 3 | 3 6 | — | 1 5 | 1 2 | 10 | 3 2 | — | 2 3 | 0 10 |
| 4 | 3 4 | — | 2 0 | 1 1 | 11 | 3 9 | leans in | 1 10 | 1 1 |
| 5 | 3 9 | leans out | 1 6 | 1 3 | 12 | 3 6 | leans out | 1 9 | 1 4 |
| 6 | fallen, built into hedge | 4 7 | 2 6 | — | 13 | 3 6 | — | 2 6 | 0 10 |
| | | | | | 14 | fallen | 4 4 | 1 4 | — |
| 7 | fallen | 5 0 | 2 4 | — | 15 | „ | 3 1 | 1 6 | — |

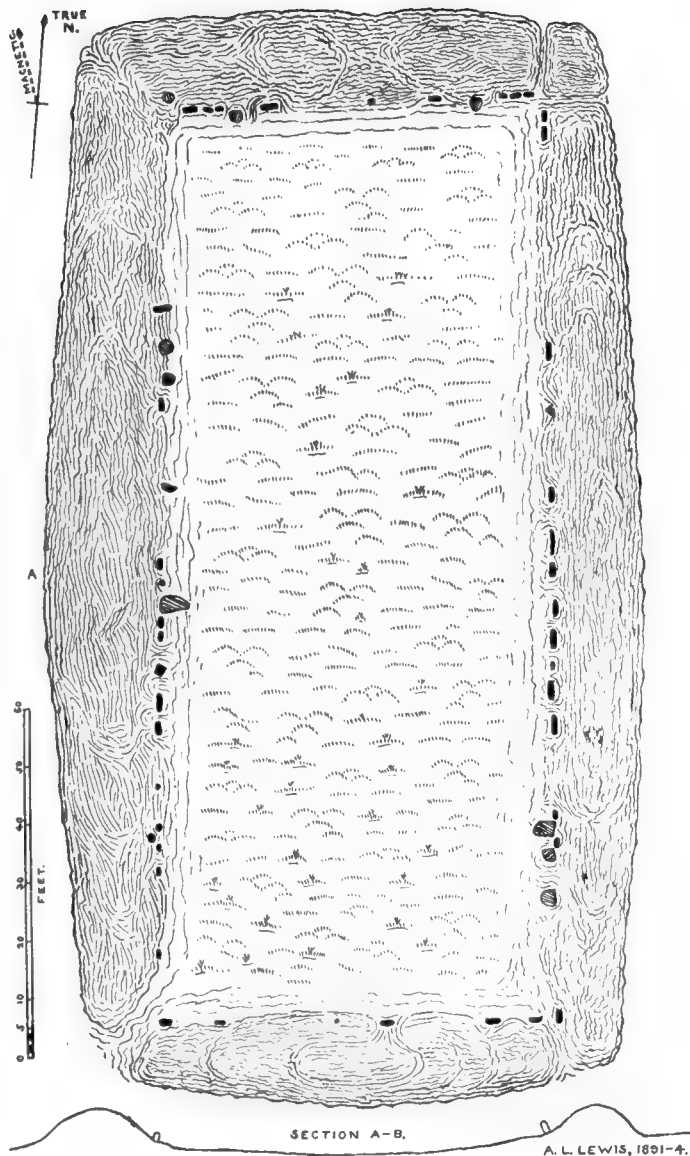
Leaze Circle is picturesquely situated on a farm of the same name, overlooking the De Lank river. It is in the parish of St. Breward, and Mr. Reynolds of St. Breward is the landowner. Between it and Stripples Stones interpose the mass of Hawk's Tor and the river aforesaid. It stands on the side of a hill, a ruined hedge crosses it north-north-west and south-south-east, and a furze-brake occupies the centre. This is a comparatively small circle for the Bodmin moors, the diameter being only 80 ft. ; the number of stones was perhaps twenty-two originally, but only fifteen and a fragment are now to be seen, the missing stones being doubtless used in constructing the hedge. Only ten stones are standing and five have fallen ; most of the latter are covered by furze and one lies in the hedge. All the stones are of granite, but none are large ; the highest stand 3 ft. 9 in. out of the ground and the largest fallen one measures 5 ft. ; they are particularly well cut, solid and regular in outline unlike those of any other circle in the county.

On the farm are the remains of many hut-circles and barrows, and near to the circle is a curious wide and deep trench, running down the hillside, which may have been a tin stream-work.

This circle has been generally overlooked by antiquaries. Lukis and Borlase do not refer to it, and Mr. A. L. Lewis appears to be the only one who has ever mentioned it,² but he has not published any plan. He calls attention to the positions of three hills which rise to the eastward,

¹ *Prehistoric Monuments*, pp. 3-30, pls. viii., ix.

² *Arch. Journ.* (1892), xlix. 136 ; *Journ. Anthropol. Inst.* (Aug. 1895).



KING ARTHUR'S HALL,
Near St. Breward, Cornwall.

STONE CIRCLES

Butter Tor (N. 58° E.), Catshole Tor (N. 69° E.), and Tolborough Tor (N. 85° E.), and which were, he suggests, associated in the minds of the circle builders with the sunrise. He also points out the alignment of Trippet Stones, Leaze, and Row Tor (N. 12° E.), Trippet Stones being invisible from Leaze.

KING ARTHUR'S HALL

On King Arthur's Downs, about 800 yards north-west of Leaze, stands the curious enclosure known as King Arthur's Hall. It may be described as a rectangular enclosure 159 ft. long by 66 ft. across, formed by a solid bank of earth from 12 ft. to 20 ft. wide and 7 ft. to 5 ft. high; this bank is kept in position within by a retaining wall of large stones set on end and embedded in the bank. About forty of these are now erect and in place, sixteen have fallen, and probably a large number have been removed; they are far from being uniform in size, the largest is 5 ft. 8 in. high and others approach this in bulk. The axis of the enclosure is N. 5° W. A depression in the centre usually holds a pool of water, a feature of very old standing, and when this exceeds its bounds, as well it may in winter on these wet moors, it finds an exit by the south-western corner.

The earliest reference that we find to this curious enclosure is by John Norden, who visited it about 1584 and wrote his work, *Speculi Britanniae Pars*, in 1610, though it was not published till 1728. He says: 'Arthures Hall, d. 14. A place so called, and by tradition helde to be a place whereunto that famous K. *Artbure* resorted. It is a square plott about 60 foote longe and about 35 foote broad, situate on a playne Mountayne, wroughte some 3 foote into the ground; and by reason of the depression of the place, ther standeth a stange or Poole of water, the place sett rounde aboute with flatt stones in this manner.' Then follows an illustration showing it to have been very much as it is now, with the pool in the middle. Mr. A. L. Lewis has described it in the before-mentioned paper,¹ and the plan which illustrates it is, by his kind permission and that of the secretary of the Anthropological Institute, reproduced for the use of this volume.

Many are the conjectures as to the origin of Arthur's Hall. It has been called 'a great cattle pound, a place of assembly, or an earthwork occupied by a small detachment of Roman troops.'² To this should be added a suggestion by Mr. A. L. Lewis that it may have been a place for cremation.³ Enclosures of a similar shape were found in Brittany, which showed unmistakable signs of burning on specially prepared granite pyres and which yielded fragments of pottery and flint flakes. These rectangular enclosures are 110 ft. by 50 ft. and 120 ft. by 40 ft. respectively, and into the walls are built menhirs.⁴ There are also, near the city of Guatemala, rectangular enclosures which bear a superficial resemblance to this, and which are associated with burial mounds and sacrificial stones.⁵ After three visits to the spot the present writer is

¹ *Journ. Anthropol. Inst.*, Aug. 1895.

² Rev. W. Jago, *Journ. Roy. Inst. of Cornwall*, 1895.

³ *Loc. cit.*

⁴ Rear-Admiral Tremlett, *Journ. Anthropol. Inst.* (November, 1885).

⁵ *Report of Smithsonian Inst.*, 1876; A. L. Lewis, *Journ. Roy. Inst. of Cornwall*, 1896.

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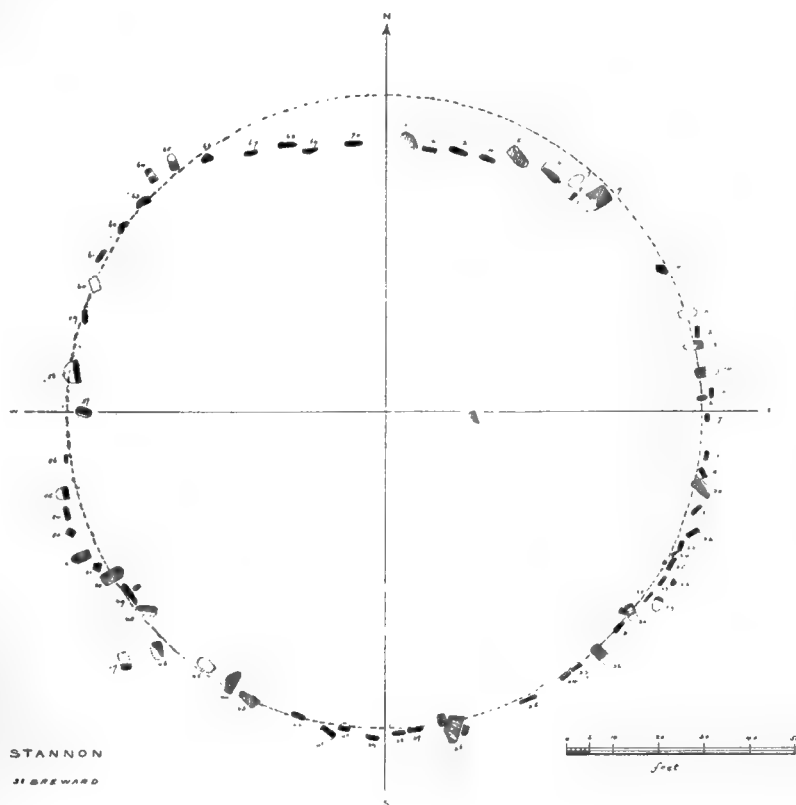
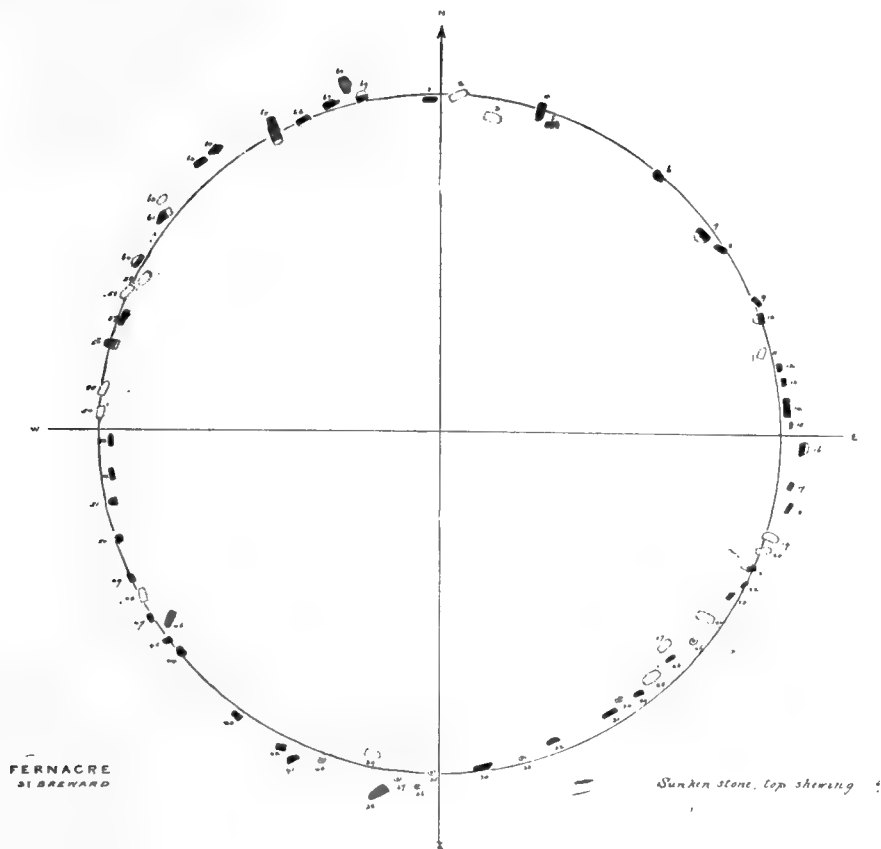
inclined to regard it as a cattle pen or pound, with an entrance at the south-west corner, now partly choked by the settlement of the banks.

FERNACRE

| No. | Height | Length | Breadth | Thickness | No. | Height | Length | Breadth | Thickness |
|-----|----------|-----------|---------|-----------|-----|----------|-----------|---------|-----------|
| | ft. in. | ft. in. | ft. in. | ft. in. | | ft. in. | ft. in. | ft. in. | ft. in. |
| 1 | 1 11 | — | 2 2 | 0 8 | 42 | 2 5 | — | 2 0 | 0 9 |
| 6 | 4 6 | — | 2 6 | 1 6 | 51 | 2 0 | — | 2 10 | 0 7 |
| 7 | leans in | 2 0 | 3 3 | 0 9 | 63 | 3 0 | — | 2 0 | 0 9 |
| 14 | 3 9 | — | 3 6 | 1 2 | 65 | fallen | 6 10 | 2 6 | 1 2 |
| 16 | 1 6 | leans out | 2 5 | 0 8 | 66 | leans in | 2 4 | 2 9 | 0 8 |
| 21 | 2 9 | leans in | 1 6 | 0 9 | 67 | 3 0 | — | 2 8 | 1 3 |
| 32 | 3 6 | — | 2 8 | 0 11 | 68 | fallen | 3 0 | 1 9 | 0 8 |
| 34 | 3 0 | — | 3 8 | 1 0 | 69 | 2 4 | leans out | 2 2 | 0 11 |

The next two circles belong to quite a different class from those already described, one of considerable area, irregular outline, and a large number of stones in the ring, many of them small. Fernacre Circle lies under the southern slope of Row Tor, 5 miles south-east of the town of Camelford, and takes its name from the nearest farm; it is situated in St. Breward parish and the landowner is Sir W. Onslow. In diameter alone it is one of the largest in Cornwall, being about 146 ft. across, but the irregularity and small size of the stones reduce it to quite an inferior rank; it appears to correspond closely with W. C. Borlase's definition of a 'ring barrow,' so many of the stones are set on edge and close together, although not touching, but there is no tumulus in the centre. Out of the sixty-nine stones shown in the plan thirty-eight are standing, ten fallen, fourteen are buried, and seven have sunk so far into the peaty soil that only their tops are visible. The tallest standing stone (6) is but 4 ft. 6 in. high, and the largest fallen one (65) measures 6 ft. 10 in. in length. All are of granite. The table of dimensions includes only the more important stones, the great majority being quite insignificant.

About 160 ft. away, eastwards, in line with the highest point of Brown Willy, is a small erect stone. Row Tor rises due north of the circle, Garrow due south, and in line with these two hills and the circle there lie, out of sight on the south as already mentioned, Stripple Stones, on the slope of Hawk's Tor. On the east is Brown Willy, the highest hill in Cornwall, and on the west, over the shoulder of Louden Hill, is another circle, Stannon. Thus we have two lines crossing Fernacre at right angles, or nearly so, for as a matter of fact the eastern line formed by Brown Willy, Fernacre, and Stannon is 2° out. If, as might appear probable, this very exact alignment, north and south, east and west, was intentional and part of a plan, and Fernacre was the pivot of the whole, it is a curious feature that the three circles mentioned should have been so effectually hidden from each other by intervening hills. Mr. A. L. Lewis has suggested that the diameters of these circles and their distances apart bear certain fixed ratios to each other, expressed



PLANS OF FERNACRE AND STANNON.

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STONE CIRCLES

in terms of a unit of 25·1 in., an Egyptian or Royal Persian cubit ;¹ but space will not allow of its adequate discussion here.

Fernacre, like other monuments on these moors, has escaped notice, and the only published plan seems to be that of Lukis and Borlase, who include it in their work on *Prehistoric Monuments*.² They admit however that bad weather greatly interfered with their survey, and it is therefore not surprising that it has been necessary in the accompanying plan to correct and add to theirs in several particulars.

A very large number of ruined huts and enclosures and some barrows are to be found on the hills near by, especially under the south and west faces of Row Tor ; if all these dwellings were inhabited at one time they must have accommodated a considerable population of tin-streamers and cattle-owners. Did the people who lived in these huts put up and use the circle ?

STANNON

| No. | Height | Length | Breadth | Thickness | No. | Height | Length | Breadth | Thickness |
|-----|------------------------|------------------|---------|-----------|-----|--------------------------------|---------------------|---------------------|-----------|
| | ft. in. | ft. in. | ft. in. | ft. in. | | ft. in. | ft. in. | ft. in. | ft. in. |
| 1 | fallen, half buried | 3 0 | 1 0 | — | 37 | 2 3 | — | 2 7 | 0 8 |
| 2 | 1 7 | leans in | 3 2 | 0 10 | 38 | 1 4 | — | 2 6 | 1 3 |
| 3 | 2 2 | — | 3 0 | 1 0 | 39 | 1 9 | — | 2 5 | 0 11 |
| 4 | 1 8 | — | 2 5 | 0 9 | 40 | 1 8 | leans in | 2 0 | 0 8 |
| 5 | fallen | 5 0 | 2 7 | — | 41 | leans out, nearly buried | 3 1 | 2 8 | 1 3 |
| 6 | " | 4 6 | 3 0 | — | | | | | |
| 8 | 1 2 | — | 1 8 | 0 5 | 42 | 1 6 | — | 2 6 | 0 7 |
| 9 | fallen, half buried | 5 0 | 3 11 | 0 10 | 43 | fallen | 3 9 | 2 2 | — |
| 10 | 1 8 | — | 1 10 | 1 3 | 44 | " | 4 8 | 2 0 | — |
| 12 | 2 2 | — | 2 0 | 0 11 | 45 | buried | 4 0 | — | — |
| 15 | 1 11 | — | 2 3 | 0 9 | 49 | 3 7 | — | 4 6 | 0 10 |
| 17 | 1 5 | — | 1 11 | 0 8 | 50 | fallen | 4 3 | 2 9 | — |
| 18 | 1 4 | — | 1 6 | 0 8 | 51 | 4 2 | — | 1 7 | 1 4 |
| 19 | 1 7 | leans in | 1 11 | 0 7 | 52 | fallen | 4 0 | covered by furze | 1 0 |
| 20 | fallen in | 4 3 | 1 11 | — | 53 | 3 9 | — | 1 4 | 1 0 |
| 21 | 1 4 | partly buried | 2 10 | 0 11 | 54 | 1 7 | — | 2 7 | 0 8 |
| 22 | 1 10 | leans out | 1 11 | 0 10 | 55 | fallen out | covered by furze | 2 6 | — |
| 23 | 1 4 | — | 1 10 | 0 9 | 56 | 2 0 | — | 1 4 | 0 9 |
| 24 | 1 2 | leans in | 2 9 | 0 11 | 57 | fallen, half buried | 2 9 | 2 0 | — |
| 25 | 2 8 | " | 3 7 | 0 11 | 58 | 4 0 | leans out | 4 5 | 0 10 |
| 27 | 1 5 | — | 2 0 | 0 5 | 59 | 2 4 | — | 2 0 | 0 9 |
| 29 | 2 0 | thin | 2 5 | — | 61 | 1 10 | — | 2 10 | 0 9 |
| 30 | fallen in | 3 1 | 1 8 | 0 11 | 62 | 2 3 | — | 2 5 | 1 7 |
| 31 | 2 2 | — | 2 9 | 0 10 | 63 | 2 8 | — | 2 9 | 1 9 |
| 32 | fallen in | 2 5 | 1 4 | — | 66 | 2 8 | — | 2 0 | 1 3 |
| 33 | 1 10 | leans in | 2 2 | 0 6 | 67 | 2 4 | — | 2 6 | 0 9 |
| 34 | 2 3 | — | 2 0 | 0 10 | 68 | 1 5 | — | 2 6 | 0 10 |
| 35 | 2 6 | — | 2 7 | 0 9 | 69 | 1 8 | — | 2 6 | 0 11 |
| 36 | fallen | 5 5 | 1 6 | — | 70 | 2 4 | — | 3 9 | 1 0 |

¹ *Journ. Anthropol. Inst.* (Aug. 1895) and *Proc. Soc. Antiq.* (1892).

² pp. 3, 30, pl. vi.

A HISTORY OF CORNWALL

Stannon Circle takes its name from the farm near by and is in the parish of St. Breward, south-east of Camelford and 4 miles by road from that town; Sir W. Onslow, bart., is the landowner. This circle and Fernacre belong, as has already been said, to a class apart, of large area, irregular outline and small stones set near together, but with no barrow in the middle. The stones here are perhaps rather larger and more uniform. The ring is so flattened on the north side as to make it quite unsymmetrical, and it is curious to note how many stone circles are thus irregular, although it would have been easy, with a stake for centre and a rope of some sort for radius, to have traced out an exact circle. 'Long Meg and her Daughters,' a circle in Cumberland with an average diameter of 332 ft., has the same flattening of the northern limb. The average diameter of this one is about 138 ft.; there are seventy stones in the ring, forty-one of which are erect and the rest fallen, some buried. The stones are small, as the above table will show, and the largest now standing (58) is 4 ft. high and 4 ft. 5 in. wide; all are of granite.

Viewed from the circle, the great hills which dominate these moors, Row Tor and Brown Willy, are conspicuous objects. The summit of Row Tor lies N. 68° E. from here and shows such a curious cleft that the question arises whether at any special season the sun would rise just behind this notch in the hill-top. Actual observation on the spot would decide, but the sunrise on May day would be about N. 71° E., three degrees farther south than the cleft. Brown Willy is less conspicuous, although its several points show up in a striking manner, due east, or nearly so, just over the slope of Louden Hill, Fernacre lying out of sight between. On Stannon farm are the remains of several hut-circles; a few are to be seen on the moor near by and many more on Louden Hill.

Lukis and Borlase do not mention this monument, but Mr. A. L. Lewis has described it in the paper so often referred to and has illustrated it by a plan.¹

NINE STONES

| No. | Remarks | Height | Breadth | Thickness | No. | Remarks | Height | Breadth | Thickness |
|-----|-----------|---------|---------|-----------|-----|------------|---------|---------|-----------|
| | | ft. in. | ft. in. | ft. in. | | | ft. in. | ft. in. | ft. in. |
| 1 | leans out | 3 8 | 3 11 | 0 8 | 6 | | 3 8 | 1 6 | 1 0 |
| 2 | | 3 7 | 1 7 | 1 1 | 7 | | 3 10 | 1 10 | 0 10 |
| 3 | | 3 7 | 2 10 | 0 9 | 8 | | 4 2 | 2 0 | 1 2 |
| 4 | | 3 10 | 1 10 | 0 8 | 9 | Centre | 3 9 | 1 2 | 0 9 |
| 5 | | 3 3 | 2 4 | 0 7 | | stone, | | | |
| | Stone at | 2 6 | 2 0 | — | | looks com- | | | |
| | base of | long | | | | paratively | | | |
| | No. 5 | | | | | modern | | | |

This circle has apparently never been figured or described by any Cornish antiquary and yet it is of a type unusual in the county, from

¹ *Journ. Anthropol. Inst.* (Aug. 1895).

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its small diameter and small number of stones. It stands on Nine Stones Down, half in the parish of Altarnun and half in that of North Hill, about $2\frac{1}{2}$ miles from Altarnun church-town; like most of the circles in East Cornwall it lies high, 900 ft. above the sea, with a wide panorama of hills and open country. The diameter is 49 ft.; there are eight stones in the ring and one near the centre, and a flat triangular stone lies at the base of No. 5; the stones are of granite, none are large, the tallest (8) being 4 ft. 2 in. above ground. The spacing is rather irregular and there is a large gap of over 40 ft. on the north which may have held, and probably did hold, another stone; if, as seems likely, the central stone is a late addition, the extra stone would merely complete the ring and still justify the name of Nine Stones, now more truly applicable to this circle than to most of the numerous families of Nine Maidens. If the gap was intentional we still have warrant for that in several British circles, possibly at Boscawen-ûn and Dawns Mên, and very probably at Whitemoorstone, Dartmoor. The number 'nine' is not uncommon in stone circles, and Mr. W. C. Borlase has mentioned several instances.¹ He says: 'Near Schönermark and at Standelchen [Germany] were several of nine stones. In most cases the number of stones was seven.' The 'Steintanz' already referred to consisted of three circles with nine stones each, and at St. Pau, south of the Garonne, 'there was a circle of nine stones called *Las Naou Peyros*, . . . nine enormous unhewn blocks, near which stands a menhir.'

The boundary of the two parishes of Altarnun and North Hill is marked by a line of stones running east-north-east (N. 63° E.) from the circle in one direction and south-west in the other. The centre stone very probably belongs to this boundary line and not to the circle. Some of the stones, but not all, have the appearance of great age, lending colour to the theory that we may have here a genuine stone row in connexion with the circle, such as is found on Dartmoor, but which has been added to and utilized as a parish boundary.

The flat stone at the base of No. 5 appears to be purposely so placed and yet to have no part in propping or supporting the standing stone. Stannon has several such prostrate stones, and it is a nice point whether or not they may have had some significance in the original scheme.

On the Ridge close at hand are various barrows, and on the east side of the circle and on Fox Tor are a number of hut-circles, but complying with the general rule they have been kept at a distance.

THE HURLERS

Leaving the circles on the Bodmin moors we go south as far as the Cheesewring Hill, on the south-west of which is a group of three circles known as the Hurlers. They are situated in the two parishes of Linkinhorne and St. Cleer, on the open down 5 miles north

¹ *The Dolmens of Ireland* (1897), ii. 502, 534, 584.

A HISTORY OF CORNWALL

of Liskeard. In a description of these circles and a survey of their history very little can be added to the paper by Mr. C. W. Dymond, F.S.A., in the *Journal of the British Archæological Association* (30 September, 1879), and it is with his kind permission that this article is illustrated by his admirably drawn plan, which though made in 1877 is still (1902) a correct representation of the monument.

The three circles lie north-north-east and south-south-west, but not in line, for we may put it that the northern circle is slightly east of the axis of the other two. The diameters are : N., 114 feet ; middle, 140 feet ; S., 108 feet. The following stones remain : N., 6 standing, 6 fallen ; middle, 8 standing, 5 fallen ; S., 2 standing, 9 fallen ; and in addition several of the so-called erect stones are leaning. The ground within the circles is rent and torn by numerous trial-pits dug in search of tin or copper, and by the removal of masses of moor-stone lying on or near the surface. Besides this many stones have been removed from the rings themselves.

Without the line of circles, 386 ft. west of the centre of the middle one, are two large stones so placed that a line drawn through both and produced would be tangential to the southern limb of the middle circle. These two stones are both leaning and look as if they might fall before long. What they were for, or what their relation to the Hurlers, it is impossible to say. They may have formed part of another circle or of a stone row or avenue.

The moors around, like the Bodmin moors, furnish many examples of early habitation. On the Cheesewring Hill is an ancient hill-fortress; several barrows are found in the neighbourhood, from one of which came a most interesting gold cup, found in 1818;¹ further north are numerous hut-circles.

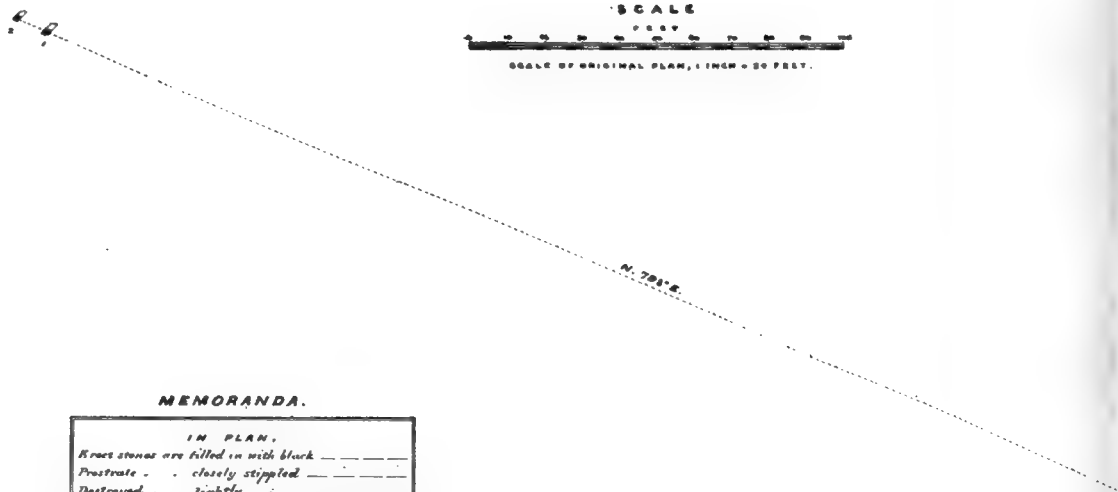
A suggestive parallel may be established between these circles and those at Stanton Drew in Somersetshire;² in each case there are three circles lying in a north-north-westerly direction, not quite in line, but deviating in the same way ; in each case the central ring is the largest ; in each case there are two outlying stones. There are considerable discrepancies also which may be noted : (a) the Somersetshire circles and the individual stones which compose them are on a much larger scale ; (b) the northern circle is there the smallest ; (c) the outlying stones at Stanton Drew, the 'cove and a monolith are aligned with the centres in a remarkable manner' ; (d) there are two short avenues attached to the circles. It is nevertheless curious that these two prehistoric monuments, so far apart geographically, should yet have so much in common. Why stone circles should be grouped in twos and threes is a mystery, and greatly complicates the problem of their origin and object.

Whereas on the Bodmin moors we had to deplore the absence of records of the past state of the various circles, we are met here by a literary *embarras de richesse*, a crowd of commentators, more or less un-

¹ *Nænia Cornubiæ*, pp. 37-41.

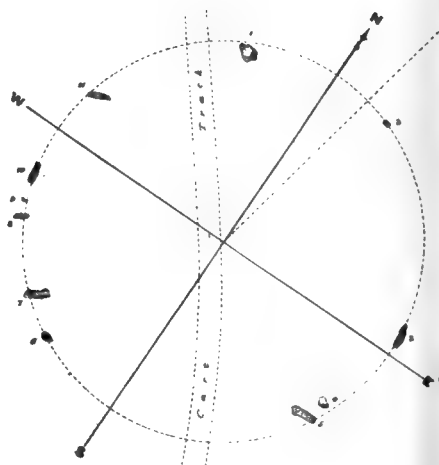
² C. W. Dymond, *The Ancient Remains at Stanton Drew* (1896).

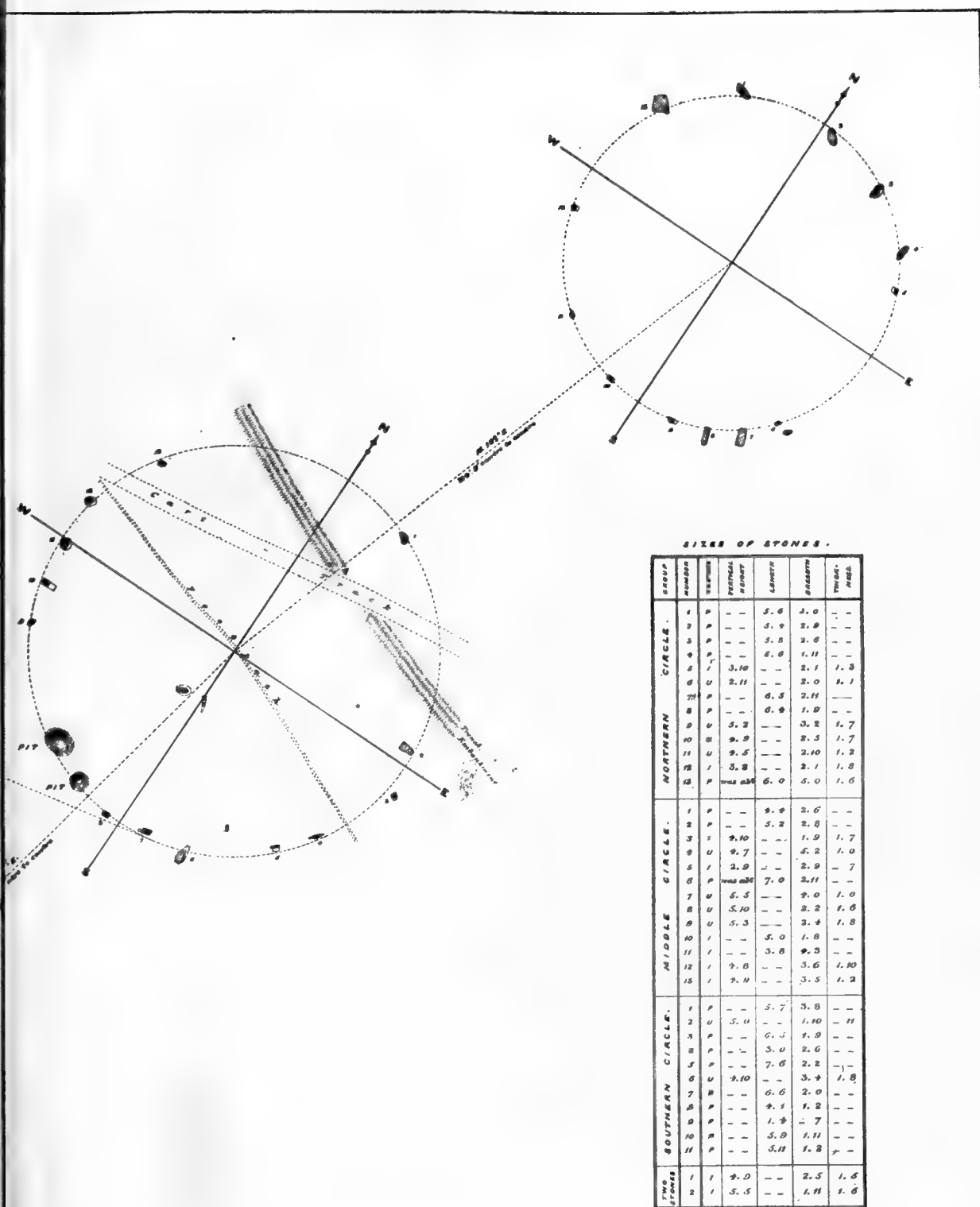
**THE HURLERS:
THREE STONE CIRCLES, No.,
NEAR
ST. CLEER,
CORNWALL.**



MEMORANDA.

| | |
|---|----------|
| IN PLAN. | |
| Eract stones are filled in with black | _____ |
| Prostrate . . . closely stippled | _____ |
| Destroyed . . . lightly | _____ |
| Overhangs . . . in full outline | _____ |
| Buried portions . . . in dotted | _____ |
| IN LIST OF STONES. | |
| U. in third column, means upright | _____ |
| I. inclined | _____ |
| P. prostrate | _____ |
| DIAMETERS OF CIRCLES. | |
| Northern circle | 112 feet |
| Middle | 190 . |
| Southern | 108 . |
| DISTANCE OF NEI DETACHED STONE. | |
| From centre of northern circle | 548' 9" |
| " " " middle | 386' 6" |
| " " " southern | 325' 0" |
| Scattered stones are not numbered | |
| Dimensions are written in feet and inches | |
| Assumed local deviation of magnetic needle, 19° 30' W. | |





Surveyed by C W. Dymond, C. E., 11th Sept, 1877.

Between pages 398, 399.

STONE CIRCLES

intelligent, from the sixteenth century onwards. The first to mention the Hurlers is John Norden, who visited them about 1584 :—

The Hurlers, c. 16, certayne stones rayzed and sett in the grounde of some 6 foote high and 2 foote square ; some bigger, some lesser, and are fixed in suche straglinge manner as these Countrey men doe in performinge that pastime *Hurlinge*. . . . This monumente seemeth to importe an intention of the memoriall of some matter done in this kinde of exercise, though time haue worne out the maner.¹

The illustration which accompanies this paragraph shows that he was unaware that the stones were arranged in circles. The next in order of date is William Camden, who says that—

the neighbours call them *Hurlers*, persuaded by a pious error that they were men changed into stones because they had profaned the Lord's day by throwing a ball. Others will have them to be, as it were, a trophy in memory of some battle, and some believe them to be placed as boundaries.²

It will be seen that the legend of the Hurlers is very similar to that of Dawns Mên and other Cornish and some German circles, only the game of 'hurling' is here pressed into service. Richard Carew (1605) mentions also 'that a redoubled numbring neuer eueneth with the first.'³ Mr. Dymond quotes from a *History of the Parish of Linkinborne* (written by the Rev. W. Harvey, vicar of the parish, in 1727 and published in 1876) an extract from a Latin account of the district, published in Amsterdam (1661), which repeats the legend. Mr. Harvey himself, however, manages to be original, for, after relating the usual traditional story, he adds :—

But the truth of the story is,—it was a burying place of the Britons, before the calling in of the heathen sexton into this kingdom. And this fable, invented by the Britons, was to prevent the ripping up of the bones of their ancestors, and so called by the name of *The Hurlers* to this day.

Mr. Harvey's tally of remaining stones agrees very nearly with a drawing by Dr. Borlase (1769),⁴ which depicts in the northern circle nine stones standing, seven fallen ; in the middle one eight standing and nine fallen ; in the southern circle three standing and nine fallen. A reference to the plan and table will show that there has been little alteration since that date, but that some of the fallen stones have been taken away. Several other writers, such as Hals, Thomas Bond of Looe, Britton and Brayley, C. S. Gilbert and John Allen, mention these circles, but contribute neither to our knowledge nor amusement. Next to Mr. Dymond's monograph the best description and plan yet published are those of Lukis and Borlase (1885).⁵

DULOE

Duloe Circle, in the parish of that name, is 4 miles north of Looe and near to Duloe church, the cluster of houses close by being called

¹ *Speculi Britanniae Pars, Cornwall*, p. 94.

² 'Hurlers vicini vocant, pio persuasi errore homines fuisse in saxa transformatos quòd pila iactanda diem Dominicum profanassent,' etc. (*Britannia*, ed. of 1607, p. 139).

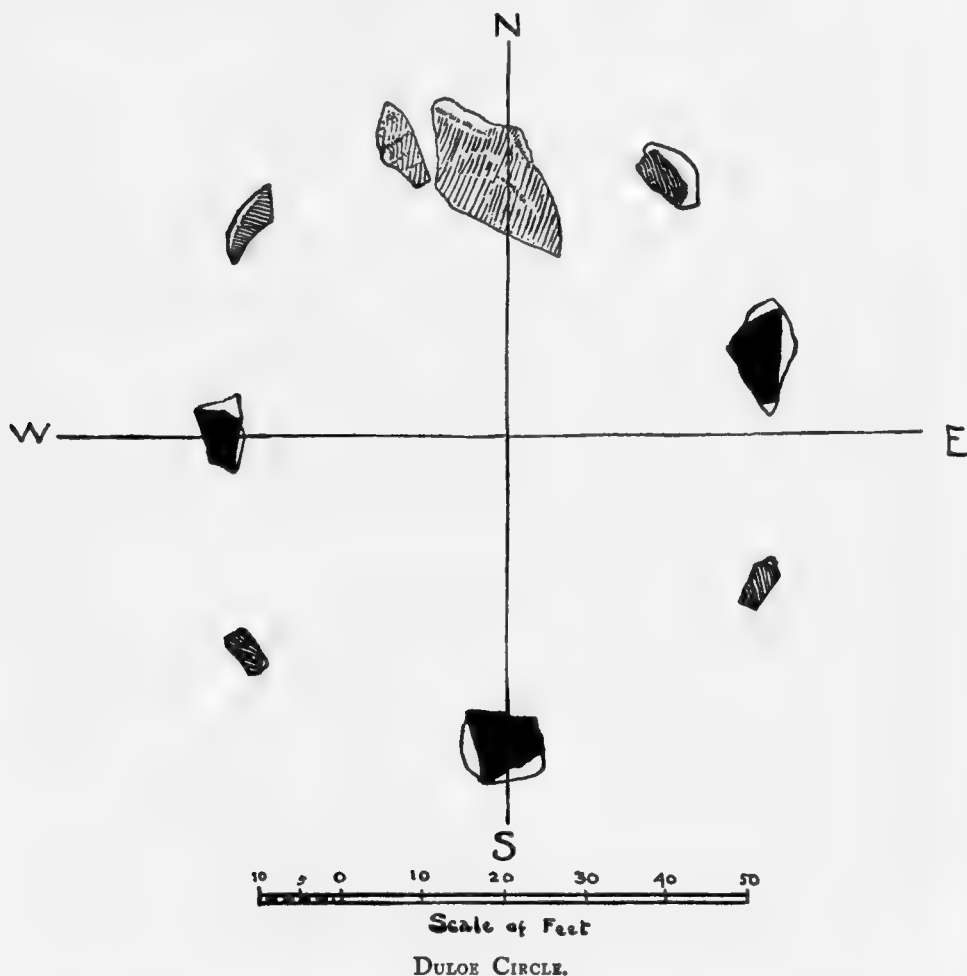
³ *Survey of Cornwall* (ed. of 1605), p. 129.

⁵ *Prehistoric Monuments*, pp. 4, 31 and pls. x. xi. xii.

⁴ *Ant. of Cornw.* (ed. 2), pp. 198-9, pl. xvii.

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Stonetown in honour of the circle. This is the smallest circle in Cornwall and stands in other ways in a class by itself. The diameters are 37 ft. and 39 ft., so the circle is undoubtedly small, and the large and for the most part shapeless masses of stone seem greatly out of proportion to the size of the ring. The stones are of quartz rock; seven are standing and one is fallen and broken. Quartz is rarely used in these megalithic monuments, and its use here is probably attributable to the distance from the granite and the still more brittle nature of the local stone, clay slate; while the friability of the quartz will account for the dimensions of the stones used and the absence of any attempt at symmetry.



Mr. C. W. Dymond, to whom we are indebted for the loan of the accompanying plan and sketches, has very fully described this circle in the *Journal of the British Archaeological Association* (February, 1882). There is no very early reference known, the first being by Britton and Brayley in 1801:—

Within a furlong north-east of the church is a small *Druidical Circle*, that has not hitherto been noticed. It consists of seven or eight stones, one of which is about nine feet in height: four are upright; the others are either broken or concealed by a hedge, which divides the circle; part being in an orchard and part in an adjoining field.¹

¹ *Beauties of England and Wales*, ii. 400-1.

STONE CIRCLES

Three other writers who follow content themselves with reproducing this description: Bond's *Looe* (1823), Penaluna's *Survey of Cornwall* (1838) and Allen's *Liskeard* (1856); but Murray's *Handbook for Devon and Cornwall* (1856) goes into detail and is more accurate. The writer says:—

A hedge bisects it, one stone lies prostrate in the ditch, five only stand upright, and three appear to be wanting to complete the circle. The stones, which are rough and unhewn, are principally composed of white quartz, and one is about 9 ft. in height.

The hedge referred to crossed the circle between Nos. 5 and 6, 1 and 8 (see plan); Nos. 1, 5, 7 and 9 were prostrate; No. 3 leaned; Nos. 4, 6 and 8 were erect.

About the year 1858 the hedge was removed, and in 1861 (or 1863) the fallen stones were set up, all but the largest (No. 1), which was broken in the process. When digging to raise this stone the workmen discovered, at about 3 feet deep, a small cinerary urn, buried in loose earth by the side of the stone, and containing human bones, some entire and 3 inches long, which crumbled to dust on exposure to the air.¹ The urn itself was broken by the workmen and only one small portion was preserved, which passed into the possession of the landowner, the late Rev. T. A. Bewes of Plymouth, and is shown in Mr. Dymond's sketch. W. C. Borlase thought that it corresponded with an urn found by him in a barrow on Morvah Hill, with which was found a coin, a 'middle brass' of Constantine the Great. Mr. E. H. W. Dunkin, who has published a description of the circle, says:—

On my recent visit to the circle I was informed that a considerable quantity of charcoal was found within the enclosure when the bisecting hedge was removed, and that much still remains beneath the turf.²

Mr. Dymond had occasion to remove some of the earth round the fallen stone and found no trace of charcoal; it may have been absent from that spot, or Mr. Dunkin's informant may have mistaken the black peaty earth for charcoal. In addition to the before-mentioned works, Lukis and Borlase have published description, plan, and sketches of this circle.³

There can be little doubt that this ancient monument, from its small area, the rude masses of quartz rock, the cinerary urn found within it, and the charcoal reported under the turf, was sepulchral in character and had little in common with the other circles which have been described. The late W. C. Borlase gave it as his opinion, in a private letter, that there never had been a tumulus within the ring. If the resemblance between the fragment preserved and the urn found on Morvah Hill can be taken as proving in any degree a like date for the two burials, then the Duloe circle may be of comparatively recent construction, but this in no way helps us to arrive at a date for the circles of a different type.

¹ *Nenia Cornubiæ*, 127, 247-52.

² 'On the Megalithic Circle at Duloe, Cornwall,' *Arch. Camb.* (1873), No. 13, p. 45.

³ *Prehistoric Monuments*, pp. 4, 30, pl. xiii.

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NINE MAIDENS, ST. COLUMB MAJOR

It seems as though the Tamar were an insurmountable barrier to certain habits and ceremonies of the primitive inhabitants, for 'stone rows,' so plentiful on Dartmoor, are almost absent from Cornwall. As they are often associated with stone circles and barrows and apparently played an important part in ceremonial observances, their absence suggests a difference in cult across the border. Reasons have been given for the suggestion that the boundary line at Nine Stones, Altarnun, may have been a stone row originally, and another and less doubtful Cornish example may well be included in an article on stone circles. In the parish of St. Columb Major, nearly 4 miles on the road to Wadebridge, is a line of stones known as the Nine Maidens. There are, as the name implies, nine stones, eight erect and standing in line in the plane of their



faces and one fallen ; the line is north-east (N. 35° E.) and south-west ; all the stones are of quartz. The north-eastern stone (1) is prostrate and broken, it measures 15 feet in length ; the tallest of those still standing (7) is 6 feet 7 inches high ; another (4) is broken off ; No. 3 leans outwards and is almost down. The accompanying sketch will give an idea of the appearance of the stones. These nine monoliths cover a distance of about 345 feet, with rather irregular intervals, and in line with them, 800 yards up the hill, there once stood a menhir of quartz, 7 ft. 6 in. high, known as the 'Old Man' or 'Grey Man.' This menhir was some years ago thrown down by two men charged with the repair of the road, and it was broken up for road metal, but its shape and size can be seen from Lukis and Borlase's drawing.

The earliest historical reference is by Richard Carew, who thus describes the stones :—

Wade bridge deliuereth you into a waste ground, where 9 long and great stones, called The sisters, stand in a ranke together, and seeme to have been so pitched, for continuing the memory of somewhat, whose notice is yet enuied vs by time.¹

¹ *Survey of Cornwall* (1605), p. 144.

STONE CIRCLES

William Hals' account is to the same effect and very like his description of the Nine Maidens, Wendron :—

On another part of this parish, near Retallock Barrow . . . is still extant, in the open downs, nine perpendicular stones, called the Nine Maids, in Cornish Naw-voz, alias the nine sisters, in Cornish Naw-whoors, which very name informs us that they were sepulchral stones, erected in memory of nine natural or spiritual sisters of some religious house, and not so many maids turned into stones for dancing on the Sabbath Day, as the country people will tell you.¹

The Rev. Richard Warner, writing in 1808, says that when he visited the spot only three stones were upright, 'the remainder lying on the ground.'² W. C. Borlase refers to them in *Nenia Cornubiæ* (1872) as—

nine erect stones averaging from 11 ft. 6 in. to 5 ft. 6 in. high, forming an ortholith, or single line . . . In the same line with these pillars, to the N.E., stands a single rude Menhir, 7 ft. 6 in. above ground, and once apparently surrounded by a small circle of stones set on edge. This goes by the name of the 'Old Man,' which to the believer in the theory of sun-worship, will sound strangely like 'Houl Maen,' or the 'Sun Stone.' Indeed it seems very probable that this stone formed part of the same monument as the Nine Maidens, and that, like many of the circles, a religious, rather than a sepulchral origin, should be assigned to it.³

From this it is evident that six of the stones were set up again between 1808 and 1872, and that the tallest stone, which has fallen *since* 1872, stood 11 ft. 6 in. out of the ground. With regard to the suggestive name of 'sun stone,' it must be borne in mind that, viewed from the stone row, the 'Old Man' would have been too far north to mark the midsummer sunrise, at that spot approximately 55° E. of N. Lukis and Borlase include a description, plan, and sketches of these stones in their great work,⁴ and Mr. Lukis remarks: 'Mr. W. C. Borlase states that it [the "Old Man"] was "once apparently surrounded by a small circle of stones set on edge," but I saw none.'

Such is the past history and present condition of the Nine Maidens, but it is no easy task to form an opinion as to its origin. The late R. N. Worth, a recognized authority on the stone rows of Dartmoor, classed it with them;⁵ and as he considered them to be associated with burial and burial rites, it is to be assumed that he regarded these stones also as sepulchral. W. C. Borlase, on the other hand, as we have seen, thought them religious in character; and we are free to accept whichever hypothesis most pleases us.

A natural sequel to a description of the stone circles and allied megalithic monuments of Cornwall would be an inquiry into their uses, date and authorship, and, so far as space admits, these points must be considered here. At the outset we are met by a considerable obstacle—the circles have never been examined systematically by digging. Reckless or unskilled excavation is much to be deprecated, but a judicious use of the spade is essential if these monuments are to be fully investigated.

¹ D. Gilbert, *Paroch. Hist. of Cornwall*, i. 220.

² *A Tour through Cornwall*, pp. 320–1.

³ pp. 98–9.

⁴ *Prehistoric Monuments*, pp. 15–16, 29–30, pls. xxxi. xxxii.

⁵ *Report of Devonshire Assoc.* (1894), xxvi. 297.

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The opinion appears to be held by some antiquaries that stone circles are necessarily *sepulchral*, and they point to the majority of the Scotch and Cumbrian circles as examples. On the other hand the principal English circles, such as Stonehenge, Avebury, Stanton Drew, and Arbor Low have never been proved to be of this character, and one Cumbrian circle, Swinside,¹ must be classed with them. Duloe Circle, just described, is probably sepulchral, but as regards the other Cornish circles no evidence exists of burial within the ring. It is yet further alleged that the barrows found near to most of the Cornish circles lead to the 'presumption that they were sacred enclosures, in some way connected with the burial of the dead.' This cannot be denied or disproved, but on similar grounds a church might be described as a mortuary chapel, because of the graves in the churchyard. The Dartmoor Exploration Committee have found fragments of charcoal under the turf at Fernworthy Circle and in the two circles called the Grey Wethers on Dartmoor, and their Report says: 'This seems to favour the assumption that the so-called "sacred circles" were places devoted to cremation, or for funeral feasts.'² Charcoal has, it is said, been found at Duloe, but so far none has been recorded at any other Cornish circle.

It has been a cherished theory of generations of antiquaries that these monuments are 'sacred enclosures,' open air temples for worship and sacrifice; this was the view of Dr. Borlase, and it has its fascinations, explaining as it does some of the facts and satisfying a love for the picturesque with visions of white-robed Druids, golden sickles and sacrificial flint knives. In a rather indirect way it has the support of Diodorus Siculus, who, writing of what he has heard of the Island of the Hyperboreans, says that they honour Apollo the sun-god above all others, 'and there also exists upon the island a grove of Apollo, exceedingly beautiful and a temple worthy of notice, of a round form [$\tau\acute{\eta}\sigma\ \sigma\chi\eta\mu\alpha\tau\iota\ \sigma\phi\alpha\iota\rho\epsilon\iota\delta\eta$], adorned with many votive offerings.'³ This round temple may very well be Stonehenge, as Sir Norman Lockyer suggests, and both he, the astronomer, and Mr. W. Gowland, the antiquary, after very thorough investigation, regard it as a sun temple and not a sepulchre. A central feature of Stonehenge, its very *raison d'être*, appears to be the orientation to sunrise at the summer solstice, and if the same could be alleged of the Cornish circles, or of any of them, it would go a long way towards proof of a religious origin. The writer has taken a number of compass bearings of hill tops, menhirs, etc., from various circles, with a view to searching for evidence of orientation, and has chosen two Celtic festivals, May Day and Midsummer Day, as probable seasons for the observation of the sunrise. His thanks are due to the Astronomer Royal for kindly furnishing accurate data on which to base the inquiry.⁴ The

¹ C. W. Dymond, in the *Trans. Cumb. and West. Antiq. Soc.* 1902, vol. ii. new ser.

² *Report of Devonshire Assoc.* 1899, xxxi. 153.

³ Lib. ii. 47.

⁴ *West Cornwall*: sunrise 1 May, N. $66^{\circ} 24'$ E., correction for 5° elevation of horizon $6\frac{3}{4}^{\circ}$; sunrise 24 June, N. $51^{\circ} 38'$ E., correction as before $7\frac{1}{4}^{\circ}$. *East Cornwall*: sunrise 1 May, N. $65^{\circ} 57'$ E., correction as before $6\frac{3}{4}^{\circ}$; sunrise 24 June, N. $51^{\circ} 9'$ E., correction as before $7\frac{1}{4}^{\circ}$. Declination of magnetic needle, June, 1902: *West Cornwall*, $18^{\circ} 19'$ W.; *East Cornwall*, $17^{\circ} 54'$ W.

STONE CIRCLES

result is mainly negative ; there is not apparently such evidence of orientation as would satisfy a critical observer, and the circles themselves are but poor observatories, having no fixed point, like the great trilithon at Stonehenge, to guide the sight. The following is a brief summary of some of the facts. At Tregaseal, the Boslow menhir is N. 66° E., and the probable sunrise point on 1 May, N. 69° E. From Dawns Mên, Chapel Carn Brea lies N. 55° W., and sunset on 24 June would be N. 53° W. approximately. Viewed from Leaze, Catshole Tor, already mentioned, is N. 69° E., and the probable sunrise point on 1 May would be N. $68\frac{1}{2}^{\circ}$ E. From Stannon, the top of Row Tor is N. 68° E., and sunrise on 1 May about N. 71° E. The highest point of Louden Hill lies N. 67° W. of Fernacre, and sunset on 1 May about N. 70° W. More detailed information on this point will be found in sundry papers by Mr. A. L. Lewis, who has paid special attention to the question.¹ Apart from exact orientation there is, as we have seen, a marked tendency towards alignment in a north-easterly direction, instances of which are the position of the menhirs at Boscawen-ûn and Dawns Mên, of the three circles, the Hurlers, and of the Nine Maidens, St. Columb.

Another phase is touched on by Richard Edmonds of Penzance,² who points out that Dr. Borlase has recorded *nineteen* stones in four of the circles of West Cornwall and seeks for an explanation in the pages of Diodorus Siculus. We have seen that there are at present nineteen stones at Boscawen-ûn and Dawns Mên, and at Whitemoorstone Down on Dartmoor ; and that, allowing for a gap in each case, Tregaseal (E) and Boskednan might have had the same number. Careful removal of the turf may some day decide whether or no nineteen was the original number of stones, but it is equally likely that the point will never be settled. Assuming Dr. Borlase to be right, and he was a careful observer, it is suggested that the number *nineteen* was intentional and had an astronomical reference, being in fact the Greek Metonic cycle. The passage of Diodorus Siculus referred to is in continuation of the one already quoted. 'They say also that the god comes into the island at intervals of nineteen years, in which time the stars perform a complete revolution ; and therefore the period of nineteen years is among the Greeks called a great year.'³ This is the Metonic cycle, the golden number of the Prayer Book, and it may be urged that this astronomical symbolism is too subtle a development for the builders of such rude monuments. This may be so, but it must be borne in mind that a difference of opinion about the dates of festivals was one of the bones of contention between the Celtic and Roman Churches.

The Phallic cult is an obscure subject, but if we remember that in other parts of the world menhirs, single or grouped, are often associated

¹ *Arch. Journ.*, 1892, xlix. 136 ; *Journ. Anthropol. Inst.* Aug. 1895 ; *Proc. Soc. Antiq.* 28 April, 1892.

² *Trans. Penz. Nat. Hist. and Antiq. Soc.* 1850, p. 383-6.

³ λέγεται δὲ καὶ τὸν θεὸν δι' ἑτῶν ἑννεακαίδεκα καταντᾶν εἰς τὴν νῆσον. ἐν οἷς καὶ αἱ τῶν ἀστρῶν ἀποκαταστάσεις ἐπὶ τέλος ἄγονται. καὶ διὰ τοῦτο τὸν ἑννεακαίδεκαετὴ χρόνον ὑπὸ τῶν Ἑλλήνων μέγαν ἐνιαυτὸν ὀνομάζεσθαι.

A HISTORY OF CORNWALL

with Phallism, it is not unreasonable to suggest that the Cornish stone circles may in part have owed their origin to some far away echo of this ancient worship.

Questions of date and authorship are closely connected, and if we knew the one we could arrive at the other. Sir Norman Lockyer and Mr. W. Gowland have lately (1901) been exploring Stonehenge, and by different routes they have arrived at a very similar conclusion, viz. that Stonehenge may be dated from 2000 B.C. to 1680 B.C. Mr. Gowland considers it to be of late Neolithic Age, and explorations lately carried out at Arbor Low Circle, Derbyshire, have led to the belief that that monument also dates from late Neolithic times. At Stonehenge the barrows around and at Arbor Low the barrow constructed out of the bank are of the Bronze Age, but the circles are thought to be earlier than this. It by no means follows that our stone circles are of the same age; they may be earlier or they may be later; we have, in fact, nothing to fix their date by except their relationship to the neighbouring huts and barrows. The round circles, the round huts, and the round barrows are, on the face of them, of the same period and that the Bronze Age, but this superficial resemblance may be illusory and the circles may be of an earlier, Neolithic Age. If the circles, huts, and barrows were contemporaneous, it follows that the men who lived in the huts and were buried in the barrows, almost certainly Celts, were also the authors of the stone circles. If however the circles are older, then their builders must have been of a pre-Celtic, primitive race. It is not impossible that, seeing how diverse are these monuments in this one county, some may have been the work of a Neolithic, pre-Celtic people, and others the work of the Celts, with, it may be, different objects and uses.

What those objects were is, for all our speculations, still hidden. We shall perhaps agree with Dr. Borlase that 'it may with great probability be asserted that . . . having for the most part been dedicated to Religion, [they] naturally became afterwards the *Curia* and *Fora* of the same Community.' Or we may copy the caution of an earlier writer, Norden, and say: 'This monumente seemeth to importe an intention of the memoriall of some matter . . . thowgh time haue worne out the maner.'

NOTE

Since the above article was written Sir Norman Lockyer, K.C.B., F.R.S., has been investigating the position and surroundings of certain Cornish circles, and has traced 'sight-lines' which are thought to have had reference to particular stars at remote periods; articles on these researches have appeared in *Nature*, 1905-6, but as they are still more or less *sub judice* this brief mention will suffice. A committee of the British Association has, through Mr. St. George Gray of Taunton, recently pursued explorations at Stripples Stones, though so far without much result.

EARLY CHRISTIAN MONUMENTS

INSCRIBED STONES

IT is only when the whole of the monuments distributed over a certain geographical area have been collected together and classified that we are able to judge of a county's wealth in this respect, and to compare it with other parts of Great Britain containing similar monuments. As a result of such a comparison Cornwall can boast, not only of possessing a larger number of inscribed stones than any other county in the British Isles, but that it also contains a far greater number and variety of early¹ crosses, as the following summary will show :—

INSCRIBED STONES

| | |
|--|------|
| Rude pillar stones | 22 |
| A fragment with one letter | 1 |
| A cut stone with raised medallion and Chi-Rho monogram | 1 |
| A Latin cross-head with Chi-Rho monogram | 1 |
| A Saxon pillar | 1 |
| Unornamented crosses | 4 |
| " cross-base | 1 |
| Ornamented crosses | 6 |
| " cross-shafts | 3 |
| " cross-base | 1 |
| " altar slabs | 2 |
| | — 43 |

CROSSES

| | |
|--|-------|
| Erect crosses, including cross-heads and cross-shafts, but omitting the nine inscribed and ornamented crosses and cross-shafts included in the above | 340 |
| Crosses now missing or destroyed, but known to have existed | 12 |
| | — 352 |

MISCELLANEOUS MONUMENTS

| | |
|---------------------------------------|-----|
| Coped stones | 4 |
| Early recumbent cross slabs | 5 |
| | — 9 |
| Total | 404 |

¹ Besides the early crosses there are a great many erect Gothic crosses, as well as now empty bases. A list of the Gothic crosses will be found in Langdon's *Old Cornish Crosses*, 423.

A HISTORY OF CORNWALL

In addition to the foregoing there are still to be reckoned some fifty or sixty early cross-bases with empty sockets, scattered about the county, and representing all that now remains of the original monuments. The crosses once belonging to these have been used as gate-posts or applied to some other utilitarian purpose,¹ and in some cases wilfully destroyed. Moreover, it seldom happens that a year passes without one or two more examples being brought to light, so that a list of this kind cannot hope to be complete while such a probability of further discoveries continues.

The two principal classes of monuments, i.e., the inscribed stones and the crosses, are so closely allied that it is impossible to separate them. This is clearly established by the forms of lettering being identical on both, and since the dates of the various alphabets are known it is possible to assign an approximate date to an inscribed cross having Celtic ornament, and by inference to those crosses which have similar ornament but no inscriptions.

Before attempting to deal with the monuments in detail it will be necessary to glance briefly at the scanty notices relating to Cornwall in early Christian times,² to see how far it was in communication with other countries and to what extent its monuments were influenced by that intercourse.

It is impossible to determine the exact date when Christianity was first introduced into Cornwall, since no structures, monuments, objects, or other remains have as yet been discovered in this part of Britain to show that the inhabitants were anything but pagan during the period of the Roman occupation, and history throws no light upon the matter prior to the fourth century.

A review of the dedications of the churches seems to prove that Cornwall was more intimately connected with Brittany and South Wales than with Ireland, and, as will be seen subsequently, this is fully substantiated by the character of the inscriptions on the early pillar stones and the style of ornament on the later sculptured crosses. For it was in Ireland and North Britain that the peculiar Celtic patterns were most highly developed; and generally speaking, the decoration of the Christian monuments from 700 to 1100 found in the south and west of England is of a different kind and often of an inferior quality. The Celtic ornament on the Cornish crosses is more akin to that occurring in Wales than to those in Ireland, Scotland, or Northumbria. A few Christian inscribed stones are found in Brittany having points in common with those in Cornwall, but as a rule there is an entire absence of interlaced work or other ornament.

Leland in his *Itinerary*, 1530-37, notices the inscribed pillar stone at Castle Dôr, and Carew in his *Survey of Cornwall*, 1602, 129, gives a quaint little woodcut of the inscription on the Redgate cross-base. Camden's *Magna Britannia* contains very few illustrations of the inscribed stones,

¹ See 'A list of the different purposes for which the Cornish crosses have been re-used.' Langdon, *Old Cornish Crosses*, 22-24, 123.

² J. R. Allen in *Journ. Brit. Arch. Assoc.* xliv (1888), 301.

EARLY CHRISTIAN MONUMENTS

the first edition having only a curious print of the Redgate stone, while the editions of 1772, 1789, and 1806 contain a plate illustrating the stones at Bleu Bridge, Mawgan Cross, Biscovey (now at Par), Castle Dôr (now at Four Turnings), and St. Cleer (Redgate).

It was not until William Borlase in 1754 brought out his *Observations on the Antiquities of Cornwall* that any considerable number of monuments was illustrated. His twelfth chapter is devoted to 'The Inscribed Monuments before the Conquest,' in connexion with which he gives two plates¹ illustrating ten of the stones. In the *Magna Britannia* of Samuel Lysons, 1814, three of the rude pillar stones already published by Borlase are given on one plate, while on another is a drawing of the inscribed cross at Lanherne.

Borlase and most subsequent authors on the subject are indebted to Edward Lhwyd, a writer of the seventeenth century, for having given the first satisfactory readings and translations of the inscriptions, and for having assigned a correct date to the monuments.

The labours of Edward Lhwyd in this direction have been ably carried on by Professors Rhys and Westwood, H. Longueville Jones, the Rev. W. Jago, Dr. Emil Hübner, and others. The most complete work on the subject is *A Catalogue of the Early Christian Monuments in Cornwall*,² compiled in 1895 by J. Romilly Allen and the writer. Even since then three other stones have been added to the list, one having been found at Cardinham³ on 3 September, 1901, by the writer. The six plates in this article illustrate all the ancient inscribed stones at present known to us in Cornwall.

It is probable that all the rude pillar stones with inscriptions found in the Celtic portion of Great Britain are of Christian origin, and they are classed as such by Hübner. The chief grounds for this opinion are (1) that they are entirely different from the pagan sepulchral stones, and in a very large majority of cases are found in or near churches; (2) that some of the stones are marked with the Chi-Rho monogram, and others have early forms of the cross, there being no evidence to show that these symbols were added after the inscriptions; (3) that several of the names mentioned are distinctly Christian, such as Paulinus and Martinus; (4) that the persons commemorated are in some cases specified in the inscription as being officers of the church, such as bishops or priests; and (5) that the form of the inscription is often of a distinctly Christian character, such as *Requiescat in pace*. The most common is, of course, *Hic jacet*, while one instance of *Hic in tumulo* occurs at Hayle.

The geographical distribution of rude pillar stones with ogams and debased Roman capitals shows that they are of Celtic origin, as they have only been found in Ireland, Scotland, Wales, Devon, Cornwall, Somerset, Dorset, Hants, and Northumberland, and not in the Saxon or Danish parts of England.

¹ The later edition of 1769 contains the same plates.

² *Arch. Camb.* 5th ser. vol. xii (1895), 50.

³ *Reliquary and Illustrated Archaeologist*, viii (1902), 50.

A HISTORY OF CORNWALL

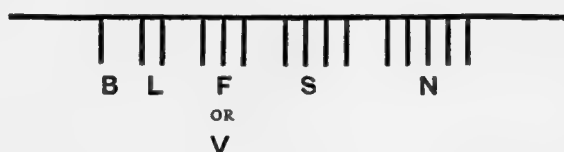
The inscriptions may be classified as follows :—

- | | | | |
|------------------------------|---|-----------|-------------------|
| (1) Ogam and | } | | about 450 to 650 |
| (2) debased Roman capitals | | | |
| (3) Anglo-Saxon capitals | . | . | about 650 to 850 |
| (4) Hiberno-Saxon minuscules | . | . | about 750 to 1050 |

Anglo-Saxon capitals are occasionally found mixed with Roman capitals, while the fourth class is employed principally on the ornate crosses.

The Ogam¹ alphabet consists of four groups of five letters, each letter composed of a straight stroke or strokes, numbering from one to five, the vowel-strokes being much shorter than the others. The strokes are cut with reference either to the vertical angle of a square pillar, or to a vertical stem-line on the face of the pillar. The first group is cut at right angles to, and on the left of, the vertical angle or stem-line, and the second group similarly on the right, the third group diagonally across the line, and the fourth group, or vowels, at right angles across the line. For the sake of convenience the stem-line is placed horizontally in the following groups :—

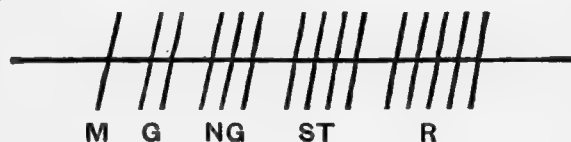
First group :



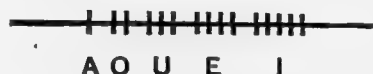
Second group :



Third group :



Fourth group :



There are three or four other additional characters in this alphabet, but since their occurrence is rare and they are not found in Cornwall it is not necessary to include them here.

¹ See R. R. Brash, *Ogham Inscribed Monuments of the Gaedhil* (1874) ; Sir S. Ferguson, *Ogham Inscriptions in Ireland, Wales, and Scotland* (1887) ; Prof. J. Rhys, *Lectures on Welsh Philology* (1887).

EARLY CHRISTIAN MONUMENTS

Debased Roman capitals are found with Ogam inscriptions on the same stone. Of their palaeographical peculiarities, the chief consists in joining up of two letters together, a part of the first letter forming part of the one adjoining, as, for instance, the M and V in the word TVWLO on the stone at Hayle. In five cases, viz. at Par, Mawgan Cross, Cuby, Sancreed No. 1, and South Hill, the first F of the word FILIVS, or FILI, is run into the following I, thus **FI**, while in the example at Sancreed No. 1 the + preceding the word FILIVS is run into the **FI**, thus forming a threefold combination.¹ Likewise in five other instances, viz. at Bleu Bridge, Cuby, Mawgan Cross, South Hill, and Worthyvale, the L of the same word is run into the following I, thus **LI**. It will be noticed that amongst the foregoing there are two cases in which the word FILI is written by both combinations thus **FI LI**, viz. at Cuby and South Hill. It is also a common practice to place the final I of a name horizontally, thus —, as in nearly all of the inscriptions on the rude pillar stones.

Anglo-Saxon capitals differ from the last by a tendency to assume angular forms, as in the C (**C**) at Doydon, Waterpit Down, and Trevena. The A has a horizontal bar across the apex, and an additional vertical stroke hanging from the v-shaped cross-bar thus **A**, a peculiarity which occurs in the inscription upon the celebrated Ardagh chalice in the museum of the Royal Irish Academy, a Celtic work of art of the best period.² It is also found on a stone at Llandawke, Carmarthenshire, and in Cornwall there are five examples on the altar slab at Camborne. The two A's on the stone at Welltown are similar, but without the top stroke, while that in the name AELNAT on the stone at Trevena has the extra bar across the top, but not the bottom one.

It is interesting to note the alteration in the form of the Roman G; at Doydon and Nanscove the bottom stroke is brought back thus **G**, and on the Lewannick No. 2 and St. Clement's stones the sickle-shaped G is used thus **G**. Other characteristic letters are the Q made like a P backwards, the **8** for th, and **P** for w, as on the Saxon stone at Lanteglos by Camelford.

Hiberno-Saxon minuscules were the natural outcome of the art of writing, in which greater speed was attained by the rounding of the letters; e.g., v became **v**, made in one stroke instead of two. The letters in this alphabet³ are practically the same as those in use at the present day, the chief differences being **E** for e, **F** for f, **3** for g, **l** for l, **P** for r, **I** or **f** for s, and **z** for t.

By far the best example in Cornwall of a minuscule inscription is that on the inscribed cross-base at Redgate, as with the exception of Cardinham No. 2 it is the only inscription in which the whole of the letters are of this form, all others being more or less mixed up with debased Roman capitals.

¹ See pl. III, fig. 24.

² George Petrie, *Christian Inscriptions in the Irish Language*, ii, 50.

³ J. R. Allen, *Monumental History of the British Church*, 66.

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A short list will suffice to illustrate the principal points to be noted in connexion with the inscribed stones :—

- (a) *Ogam*¹ inscriptions ; 2, both at Lewannick.
- (b) *Inscriptions written in horizontal lines*, 3 ; Biscovey (now at Par), on both front and back, Hayle, and Lewannick No. 1.
- (c) *Inscriptions preceded or followed by a Cross*. These are very rare on the monuments with debased Roman capitals only, an isolated example being found on the cross at Sancreed, No. 1. The remarkable position of this portion of an inscription seems to suggest that the cross is a converted pillar stone. In inscriptions with mixed capitals and minuscules they are much more common, and occur at Biscovey (front and back), Boslow, Cardinham No. 2, Lanherne, Lanteglos by Camelford, Trevena, and on the Camborne altar slab, No. 1.
- (d) *Ornamented crosses*, 6 ; Cardinham No. 2, Lanherne, Penzance, Sancreed Nos. 1 and 2, and Trevena.
- (e) *Ornamented cross-shafts*, 3 ; Biscovey, Gulval, and Waterpit Down.
- (f) *Cross-bases*, 2 ; Lanhadron and Redgate, the latter has Celtic ornament on its three other faces.
- (g) *Altar slabs*, 2 ; In Camborne Church, and at Pendarves ; both have key-pattern borders.
- (h) *Stones with a cross in relief*, 3 ; Castle Dôr, St. Clement, and Doydon.
- (i) *Shafts with a mortice at the top* (as if for the reception of some terminal), 4 ; Biscovey, Castle Dôr, Doydon, and Waterpit Down ; the top of the rude pillar stone at Mawgan Cross appears to have been roughly shaped as a tenon. It would be interesting to know by what the stones at Castle Dôr and Mawgan Cross were surmounted. The remainder would probably have had a cross-head.
- (j) *With the Chi-Rho monogram*, 5. The number of stones bearing this symbol, which is common in Italy and Gaul, is very small in Great Britain, only twelve examples being at present known to exist, or to have existed. Five of that number, in fact all in England, belong to Cornwall,² viz. :—

ENGLAND (CORNWALL)

| | |
|----------------------------|---|
| St. Endellion | On Doydon headland |
| Phillack | In gable of south porch of church |
| St. Just in Penwith, No. 1 | Found at St. Helen's Chapel, Cape Cornwall, now missing |
| " " " " No. 2 | In the church |
| South Hill | In the rectory garden |

SCOTLAND (WIGTONSHIRE)

- Stoneykirk In the old burying ground of Kirkmadrine (two).³
- 'A drawing of a third stone (at Stoneykirk) has been preserved by Dr. Mitchell, in the *Proceedings of the Society of Antiquaries of Scotland*, but the monument itself is unfortunately either lost or destroyed.'
- Whithorne Now preserved in the ruined church of St. Ninian.⁴

¹ The Rev. W. Jago considers that the Worthyvale stone has Ogam characters upon it, but as they merely consist of some three or four doubtful notches, and the edge of the stone above and below them is quite clean, showing no further remains whatever, there does not seem to be very much foundation for this theory, more especially since such an authority as Professor Rhys has described it to me as 'a doubtful bit of Ogam.'

² Since the above was written the author has found a small incised Chi-Rho monogram $4\frac{1}{2}$ inches high, and of the later form. It is cut on a jamb stone on the Norman south doorway at the church of Lanteglos by Fowey.

³ *Proc. Soc. Antiq. Scot.* ix, 586. Stuart, *Sculptured Stones of Scotland*, ii, pl. lxxi.

⁴ *Proc. Soc. Antiq. Scot.* ix, 578. Stuart, *Sculptured Stones of Scotland*, ii, pl. lxxviii. See also J. R. Allen, *Early Christian Monuments of Scotland* (1903), 495, figs. 532, 533, 534.

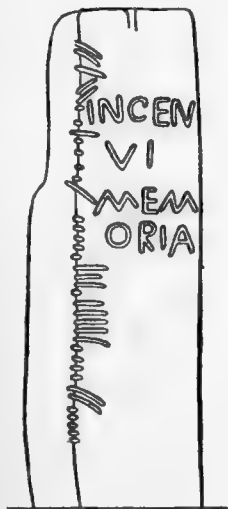


FIG. 1.

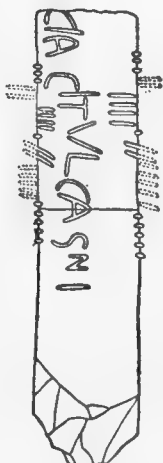


FIG. 2.



FIG. 3.

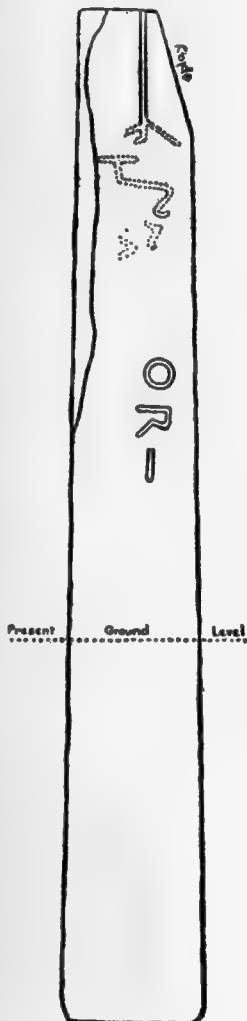


FIG. 4.



FIG. 5.

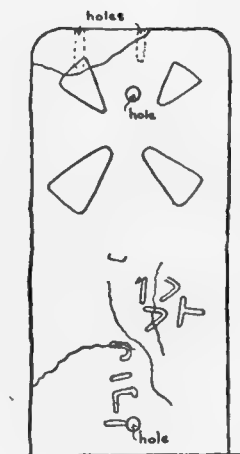


FIG. 6.



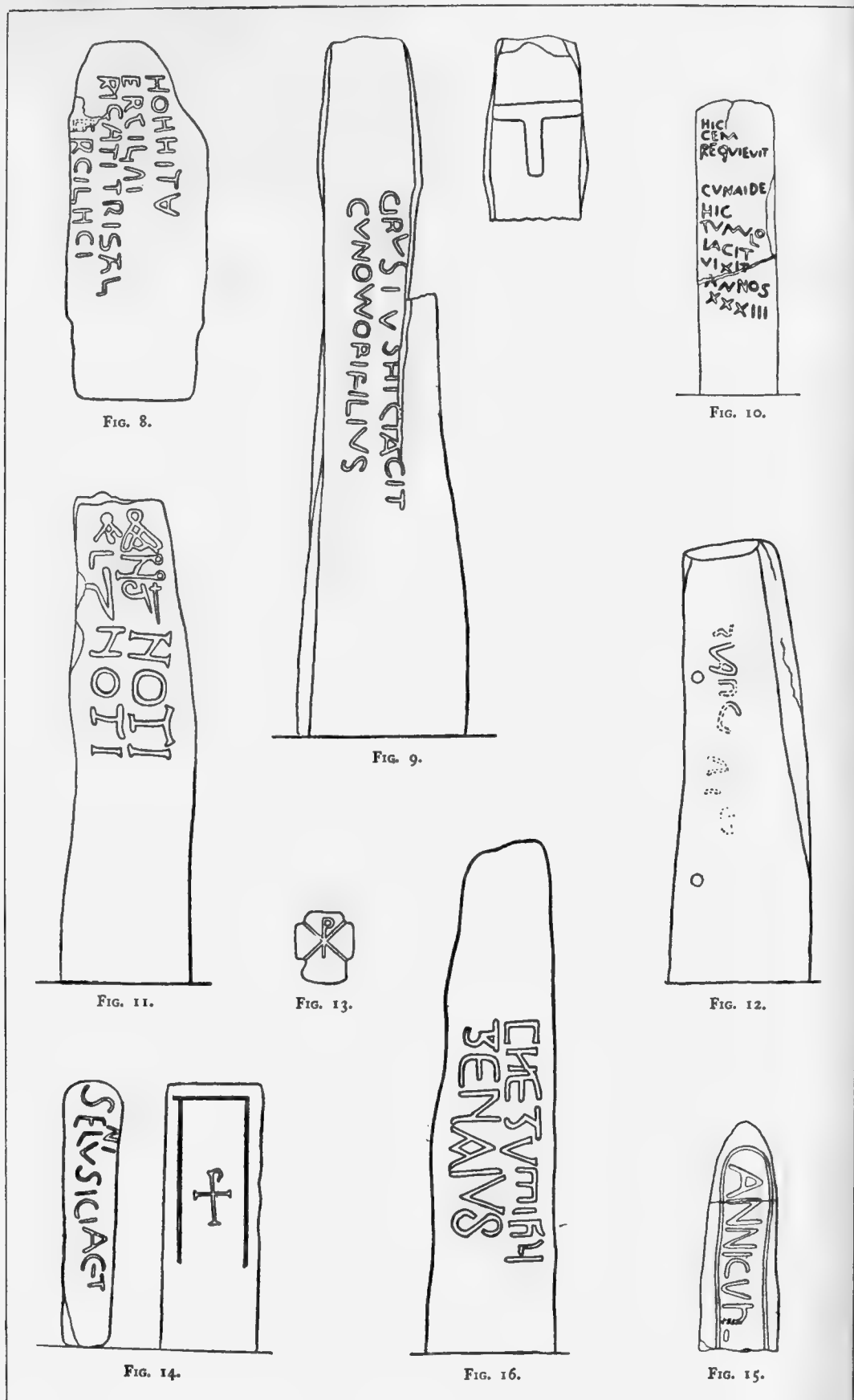
FIG. 7.

Scale, $\frac{1}{4}$ linear.

Fig. 1. Lewannick, No. 1—Fig. 2. Lewannick, No. 2—Fig. 3—Bleu Bridge—Fig. 4—Cardinham No. 1—Fig. 5. St. Clement—Fig. 6. St. Colum Major—Fig. 7. St. Cubert.

A HISTORY OF CORNWALL

PLATE II



Scale, $\frac{1}{2}$ linear.

Fig. 8. Cuby—Fig. 9. Four Turnings (from Castle Dör)—Fig. 10. Hayle—Fig. 11. St. Hilary—Fig. 12. Indian Queens—
Fig. 13. St. Just in Penwith, No. 1—Fig. 14. St. Just in Penwith, No. 2—Fig. 15. Lanivet—Fig. 16. Mawgan Cross.

EARLY CHRISTIAN MONUMENTS

WALES (CARNARVONSHIRE)



Penmachno In the church.¹
Trefllys In the church.²

ISLE OF MAN

Kirk Maughold³

In Ireland none have been found up to the present.

The earliest instance of the occurrence of this symbol at Rome belongs to the year 323, and its use in Gaul, as shown by dated examples, extended from 377 to 493, at which time it was superseded by the cross as a symbol of our Lord; and since it died out in Gaul at the end of the fifth century we shall not be far wrong in allowing, say, a hundred years for its disappearance in Great Britain. Its presence, therefore, on the Cornish stones is evidence not only of their great age but it further tends to show that Christianity must have been introduced into Cornwall at a very early period.

The earliest form of the monogram is that in which the diagonal strokes of the X cut the lower part of the P, as on the stone at Phillack, No. 1, and St. Just in Penwith, No. 1, thus ; and in the remaining three instances the X is represented by a horizontal stroke across the tail of the P, thus . The partial disappearance of the loop of the P from the examples at St. Just in Penwith, No. 2, and Doydon shows them to be of a later date than the others, a fact which is confirmed in the latter example by the Saxon character of the name and form of letters in the inscription.

In the accompanying plates the illustrations are drawn to a uniform scale of $\frac{1}{2}$ inch to the foot, so that their relative sizes may be compared.

An alphabetical list of the inscribed stones, with details and inscriptions, is here given. The stones are described under the headings of the parishes in which they occur.

BISCOVEY.—See PAR.

BLEU BRIDGE.—See GULVAL (2).

BOSLOW.—See ST. JUST IN PENWITH.

CAMBORNE.—(1) Altar slab in the church, under the communion table, said to have come from a little church at Newton, near Treslothan, demolished about 120 years since. The slab has a cross in the middle, and a key-pattern border within which is the inscription: LEUIUT IUSIT HEC ALTARE PRO ANIMA + SUA. (Plate IV, fig. 31.) (2) Altar slab in the garden in front of Pendarves House, found many years ago at Treslothan, and now used as the stand for a sundial. It has a cross enclosed in a rectangle in the middle, and a key-pattern border. Within the border is the inscription, which may be read: ÆGURED; suggested by Rev. W. Jago (Plate VI, fig. 41.)

CARDINHAM.—(1) Rude pillar stone standing on east side of churchyard, where it was set up in 1896, before which time it leant against the south wall of the churchyard. Of the inscription only ORI is now distinct.⁴ (Plate I, fig. 4). (2) Four-holed cross with interlaced ornament, standing on south side of churchyard. The shaft and head had been built into the outside of the east wall of the chancel, and were taken out in 1872. Inscription: ARTHI + (Plate V, fig. 32). (3) Rude pillar stone standing in lane leading to Tawna, in use as a gatepost. It was discovered during the last ordnance survey. Of the inscription only ONI EPS is now clear. (Plate IV, fig. 26). (4) Rude pillar stone, standing in village (Well-

¹ J. O. Westwood, *Lapidarium Walliae*, pl. lxxix, No. 2, and p. 175; *Arch. Camb.* (1863), 257. See also J. R. Allen, *Early Christian Symbolism*, where most of the above are illustrated.

² *Arch. Camb.* 6th ser. v (1905), 70.

³ *Reliquary and Illustrated Archaeologist*, viii (1902), 126.

⁴ The name ORI occurs on a stone at Llystyn Gwyn, in Carnarvonshire. See *Proc. Soc. Ant.* (ser. 2), xix, 255, and *Arch. Camb.* (ser. 6), iv, 149. It is not clear whether the ORI on the Cornish stone is in itself a name, or only part of one, for at Fowey (Castle Dôr) the second name in the inscription ends in ORI, as does also the first name on the stone at St. Columb Minor (Rialton).

A HISTORY OF CORNWALL

town) against wall of wagon shed on farm. Formerly it was inside this building, a gate being hung to it. Inscription: *VAILATHI FILI VROCHANI*. (Plate IV, fig. 28.)

CASTLE DÔR.—See FOWEY.

CUBY.—Rude pillar stone built into south-west angle of church just above the ground. It is often known as the Tregoney stone. Inscription in four lines: *NONNITA ERCILINI (?) RIGATI TRIS FILI ERCILINCI*. (Plate II, fig. 8.)

DOYDON.—See ST. ENDELLION.

FOUR TURNINGS.—See FOWEY.

FOWEY.—Rude pillar stone now standing at Four Turnings, on the high road from Fowey to Lostwithiel. It was formerly called the Long Stone, and stood at Castle Dôr, in the parish of Tywardreath, two miles north of its present position. On the front of the stone is the inscription in two lines: *CIRVSIUS HIC IACIT CVNOMORI FILIUS*. On the back is a Tau cross in relief. (Plate II, fig. 9.)

GULVAL.—(1) Cross-shaft with interlaced ornament, standing on south side of churchyard, found on taking down the chancel of the church, 18 September, 1885. It is fixed upside down, the tenon being upwards. Inscription in two lines: *VN VI*. (Plate VI, fig. 39.) (2) Rude pillar stone standing in Barlowena Bottom, by roadside, between the churches of Gulval and Madron. In Borlase's time it was lying across the brook, used as a foot-bridge. Inscription in two lines: *QUENATAVCI IC DINVI FILIVS*. (Plate I, fig. 3.)

HAYLE.—See ST. EARTH.

INDIAN QUEENS.—See ST. COLUMB MAJOR.

LANHADRON.—See ST. EWE.

LANHERNE.—See MAWGAN IN PYDER.

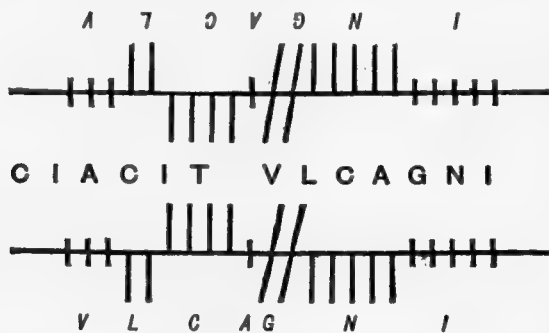
LANIVET.—Rude pillar stone, lying in the churchyard in two pieces by the south porch and near the coped stone. Formerly built in upside down in the wall of an old house near west end of church. Inscription: *ANNICVS*. (Plate II, fig. 15.)

LANTEGLOS BY CAMELFORD.—Pillar stone standing in the churchyard on south side of church. Formerly used as a prop to a barn roof at Castle Gough, afterwards moved to rectory garden, and thence to churchyard in 1900. Inscription on front of stone in two lines: *+ ÆLSEL ð 7 GENERE ð POHTE ðYSNE SYBTEL SEL*,¹ continued in one line on right side: *FOR ÆLPYNEYS SOUL 7 FOR HEY*. (Plate VI, fig. 40.)

LEWANNICK.—(1) Rude pillar stone standing on south side of churchyard, found by A. G. Langdon, 7 June, 1892. Inscription on front in four lines: *INCEN VI MEM ORIA*, and on the angle in Ogam characters:



(Plate I, fig. 1.) (2) Rude pillar stone standing in the church, found by F. H. Nicholls, 17 July, 1894, in two pieces in the south porch, built into different walls. Ogam inscriptions on both front angles, and between them an inscription in Roman letters, thus:



(Plate I, fig. 2.)

¹ SEL on the front of the stone is really the end of the inscription on the side, thus: *HEYSEL*.

EARLY CHRISTIAN MONUMENTS

PLATE III



FIG. 17.



FIG. 18.



FIG. 21.



FIG. 21a.

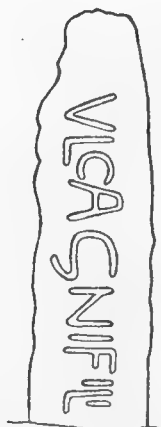


FIG. 19.

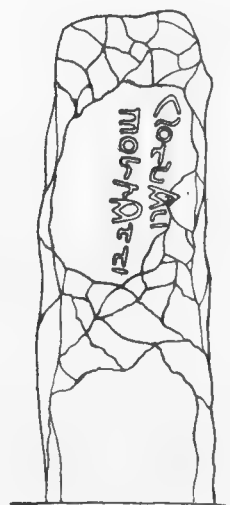


FIG. 22.



FIG. 23.

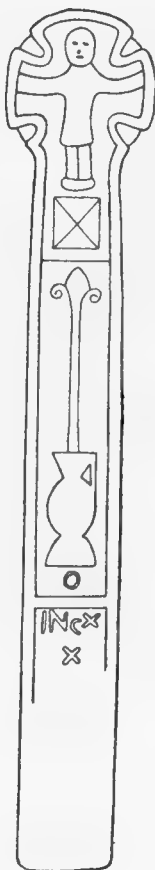


FIG. 24.

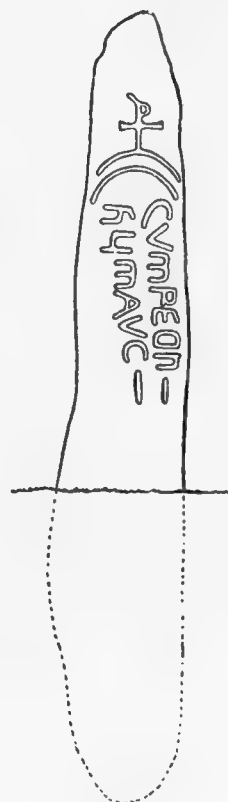


FIG. 25.

Scale, $\frac{1}{8}$ linear.

Fig. 17. Mên Scryfa—Fig. 18. St. Michael Penkevel—Fig. 19. Nanscowe—Fig. 21. Phillack, No. 1—Fig. 21a. The same as last, but to a larger scale—Fig. 22. Phillack, No. 2—Fig. 23. Rialton—Fig. 24. Sancreed, No. 1—Fig. 25. South Hill.

A HISTORY OF CORNWALL

PLATE IV



FIG. 26.

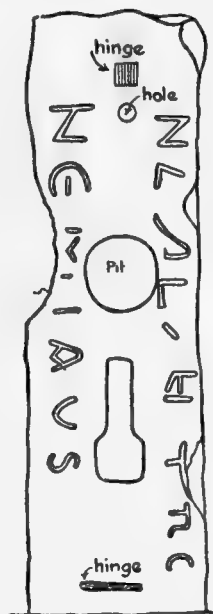


FIG. 27.

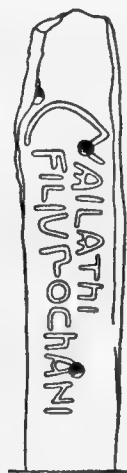


FIG. 28.

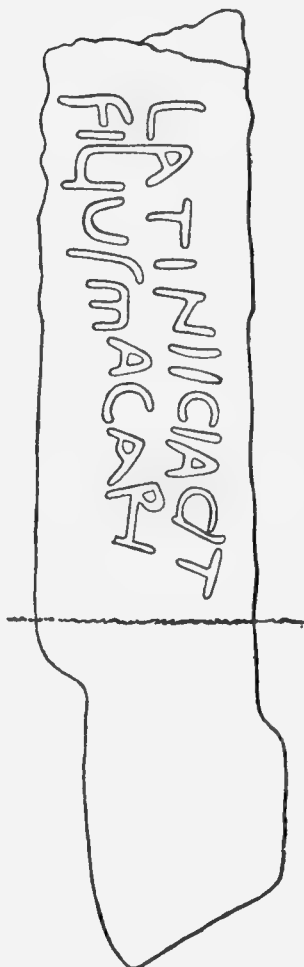


FIG. 29.

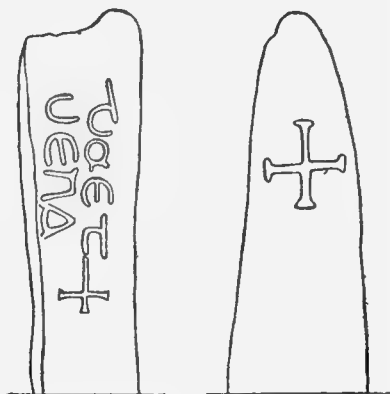


FIG. 30.

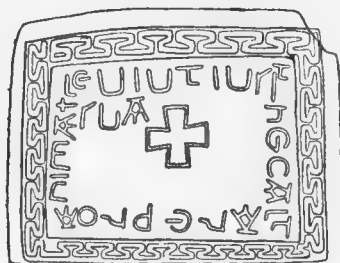


FIG. 31.

Scale, $\frac{1}{2}$ linear.

Fig. 26. Tawna—Fig. 27. Treveneage—Fig. 28. Welltown—Fig. 29. Worthyvale—Fig. 30. Boslow—
Fig. 31. Camborne.

EARLY CHRISTIAN MONUMENTS

MADRON.—Rude pillar stone standing on Gûn Mên Scryfa Down, near the ‘Nine Maidens.’ Thrown down by treasure hunters, but re-erected about 1862. Inscription in two lines: *RIALOBRA NI CUNOVALI FILI*. (Plate III, fig. 17.)

MAWGAN IN MENEAGE.—Mawgan Cross.¹ Rude pillar stone standing in the village at the meeting of three roads, and believed to be *in situ*. Inscription in two lines: *CNEGUMI FILI GENAIVS*. (Plate II, fig. 16.)

MAWGAN IN PYDER.—Wheel-cross with interlacing ornament. Standing in the Convent garden, Lanherne, and brought many years since from a field called Chapel Close, on the barton of Roseworthy, Gwinear. On front a figure of our Lord; at base of shaft an inscription in four lines: *+ BF EID ET IMAH*. On back five circular bosses, and at base of shaft *RŪ HOL*.² (Plate V, fig. 34.)

MINSTER.—(1) Cross-shaft with interlacing ornament, standing in its base by the right side of the road from Tintagel to Launceston, on Waterpit Down. About 1860 it was taken to Trekeek farm and used as the pivot-stone for a threshing machine, but in 1889 it was restored to its base. Inscription in five lines on front of shaft, the letters much defaced: *CR VX IHC VR OC (?)* (Plate VI, fig. 43.) (2) Rude pillar stone lying by right bank of stream about a furlong above Slaughter Bridge in Worthyvale. Borlase says this stone ‘was formerly a foot-bridge.’ It is locally known as ‘King Arthur’s tomb.’ Inscription in two lines; *LATINI IC IACIT FILIUS MACARI*. (Plate IV, fig. 29.)

NANSOWE.—See **ST. BROCK**.

PAR.—Ornamented cross-shaft from Biscovey, now standing in Par churchyard. Bought and removed there in September, 1896, by Rev. D. R. Vaughan. Formerly stood in use as a gate-post at Biscovey Gate on south side of road from St. Blazey to St. Austell. On the front is the inscription: *+ AL R O R O N* in three lines under the ornamentation, and on the back in two lines, with ornament above and below, are the words: *VLLICI + FILIVS*. (Plate V, fig. 35.)

PENDARVES.—See **CAMBORNE**.

PENZANCE.—Ornamented cross now standing in the garden in front of the library. Prior to 1824 it stood in the Green Market, in which year it was removed to North Street. In 1868 it was placed against the west end of the market-house, and on 15 July, 1899, it was erected at the library. Inscription on two faces, not yet deciphered.

PHILLACK.—(1) Cut stone with raised medallion built into gable of south porch of church. When the church was taken down in 1856 it was found under the plaster on the inner face of the south wall. Within the circle is the Chi-Rho monogram. (Plate III, fig. 21.) (2) Rude pillar stone standing in the churchyard on south side, found at the same time as the last, in the foundations of the chancel. The inscription *CLOTUALI MOBRATTI* is in two lines. (Plate III, fig. 22.)

REDGATE.—See **ST. CLEER**.

RIALTON.—See **ST. COLUMB MINOR**.

ST. BROCK.—Rude pillar stone standing on farm at Nanscowe in use as a gatepost. No previous history of it is available. On the front is the inscription *VLCAGNI FILI*, and on the right side *SEVERI*. (Plate III, fig. 19.)

ST. CLEER.—Ornamented cross-base standing in a field at Redgate named ‘Pennant,’ close to ‘The Other Half Stone.’ In 1849 it was taken out of a pit in which it had lain for some years, and was again set up. Filling the front in five lines is the inscription, *DONI ER TRO GAVIT PRO AN IMA* (Doniert rogavit pro anima). (Plate V, fig. 36.)

ST. CLEMENT.—Unornamented cross standing in the vicarage garden by steps leading up to the churchyard, and formerly used as a gatepost to one of the fields in this parish. At the head is a rude cross in an oval, beneath which there runs vertically down the pillar stone the inscription *IGNIOC VITALI FILI TORRICI*. (Plate I, fig. 5.)

ST. COLUMB MAJOR.—(1) Unornamented cross standing in the churchyard on east side of south porch. Formerly stood outside the churchyard wall, prior to which it had been used as a gatepost. Only a very few letters of the inscription are now left. (Plate I, fig. 6.) (2) Rude pillar stone standing in village near a building which was formerly the ‘Indian Queen’ public-house.³ It has been used as a gatepost. Borlase says he ‘accidentally met with this stone,’ and gives *RVANI HIC IACIT* as the reading of the inscription; only part of the name is now distinguishable. (Plate II, fig. 12.)

¹ From a drawing by Rev. W. Jago.


² By comparison with Sancreed No. 2 this word seems to be *RUNHOL*.

³ The village is called after it, Indian Queens.

A HISTORY OF CORNWALL

ST. COLUMB MINOR.—Rude pillar stone built into wall of one of the farm buildings at Rialton, on the outside. No previous history available. The inscription is in two lines : BONEMIMORIILLI TRIBVNI. (Plate III, fig. 23.)

ST. CUBERT.—Rude pillar stone built into west wall of church tower on the outside. No previous history available. The inscription, in three unequal lines, runs as follows : CONETOCI FILI TEGERNO MALI. (Plate I, fig. 7).

ST. ENDELLION.—Unornamented cross-shaft standing on Doydon headland. Originally it stood at the cross roads about midway between St. Endellion and Port Quin, and was then called Long Cross. Its base remains *in situ*. The inscription is in two lines :  BRO CAGNI IHC IACIT NADOTTI FILIVS. On the back of this stone is an equal-limbed cross in relief. (Plate VI, fig. 38.). Above reading by Rev. W. Jago.

ST. ERTH.—Rude pillar stone standing in a plantation near west end of railway viaduct at Hayle, by the side of a path against a bank. Found in 1843 four feet below the surface, near its present position. The ten remaining lines of inscription are : HIC [IN PA] CEM REQVIEVIT (here a line is obliterated) CVNAIDE HIC [IN] TVMVLO IACIT VIXIT ANNOS XXXIII. (Plate II, fig. 10.)

ST. EWE.—Cross-base at Lanhadron¹ by the roadside on Nunnery Hill, buried in a hedge. Excavated and uncovered on 29 April, 1879, for inspection by Rev. W. Jago. Of the inscription only CRUCEM is legible. (Plate V, fig. 33.)

ST. HILARY.—(1) Rude pillar stone standing in the churchyard against east bank of path on south side. Found in the ruins of the church after its destruction by fire in 1853. The inscription² is in two lines : NOTI NOTI. (Plate II, fig. 11.) (2) Plain cross standing at entrance to East Treveneage³ Farm, in use as a gatepost. Formerly used in its original state as a gatepost, but afterwards re-cut for the same purpose in a new position and entirely defaced. Nothing is now left of the inscription except portions of an N and an A. A long and wide-limbed Latin cross in relief on the back of the stone was obliterated at the same time as the lettering. (Plate IV, fig. 27.)

ST. JUST IN PENWITH.—(1) A Latin cross-head found at St. Helen's Chapel, Cape Cornwall; now missing. Blight gives a sketch and some notes of the chapel.⁴ It has the Chi-Rho monogram at the intersection of the limbs. (Plate II, fig. 13.) (2) Rude pillar stone in the church, standing at the west end of the north aisle. Found in 1834 in east wall of chancel, when it was taken down and used as a credence table till 1901. On the front is the Chi-Rho monogram, and on the right side in two lines is the inscription NI SELVS IC IACIT. (Plate II, fig. 14.) (3) Rude pillar stone standing on a waste piece of land at Boslow, called Water Lane. It appears to be *in situ*. On the front is an inscription in two lines : TAET(?) + UENA, and on the left side is an incised cross with expanded ends. (Plate IV, fig. 30.)

ST. MICHAEL PENKEVIL.—Fragment built into buttress of old building. Noticed by the writer, who failed to find any other portions. The letter R is inscribed on the middle of this fragment. (Plate III, fig. 18.)

SANCREED.—(1) Ornamented cross standing in the churchyard by west side of path from south entrance. Formerly deeply sunk in ground. Inscription found by the writer in digging to find lower parts of ornament. Raised and mounted on an old cross-base by the late vicar, Rev. R. Basset Rogers, on 15 June, 1895. On the front of the head in bold relief is the figure of our Lord with extended arms, clothed in a tunic, the feet resting on a rounded projection. The middle section of the shaft is filled by a jug holding a long-stemmed fleur de lis. At the top of the lowest panel is an almost obliterated inscription, apparently INCX with x below. On the right side, below the diagonal key-pattern ornament, is a much-defaced inscription in two lines, NI + FILIVS IC. (Plate III, fig. 24.) (2) Ornamented cross standing in the churchyard on east side of south porch. Shaft found in 1881 built into east wall of church. The head had been for years on the churchyard hedge. Inscription found as in last instance. Erected on a rough base by the vicar and the writer on 13 June, 1894. On the front of the head is the figure of our Lord in relief. Below the interlaced work of the middle panel is an inscription in two lines, R U NH O [L] (?) Possibly there may have been other letters at the top of the shaft. (Plate VI, fig. 37.)

¹ From a drawing by Rev. W. Jago.

² There are some unintelligible figures, or possibly letters, at the commencement of the inscription.

³ From a sketch by Rev. W. Jago.

⁴ J. T. Blight, *A Week at the Land's End*, 179.

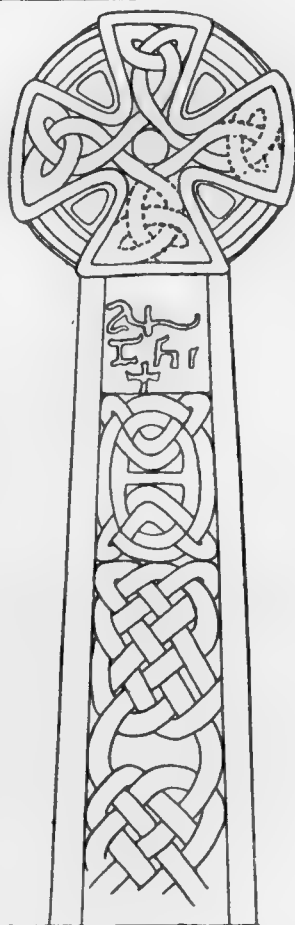


FIG. 32.

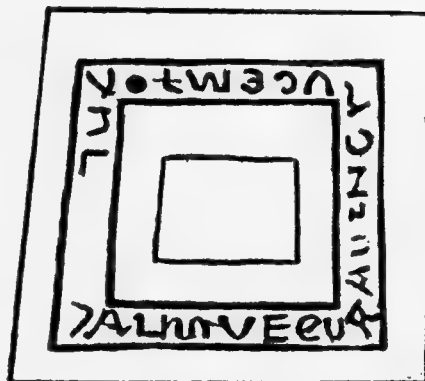


FIG. 33.

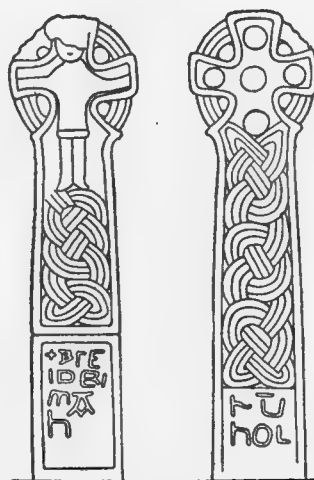


FIG. 34.

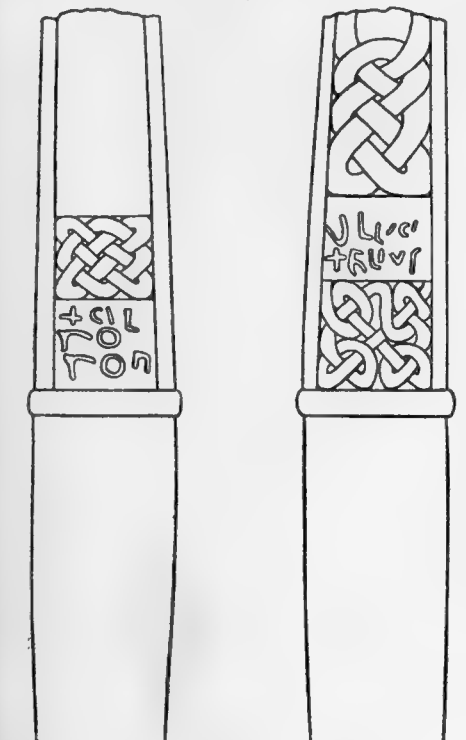


FIG. 35.

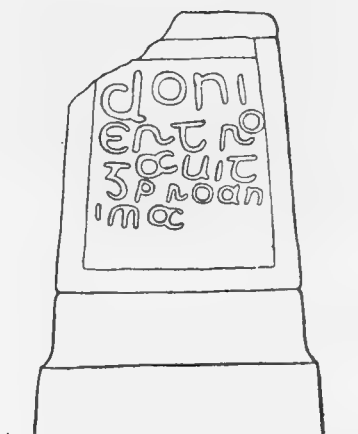


FIG. 36.

Scale, $\frac{1}{4}$ linear.

Fig. 32. Cardinham, No. 2—Fig. 33. Lanhadron—Fig. 34. Lanherne—Fig. 35. Par (from Biscovey)—
Fig. 36. Redgate.



FIG. 37.

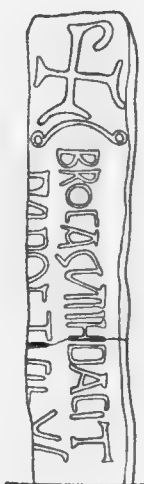


FIG. 38.



FIG. 39.

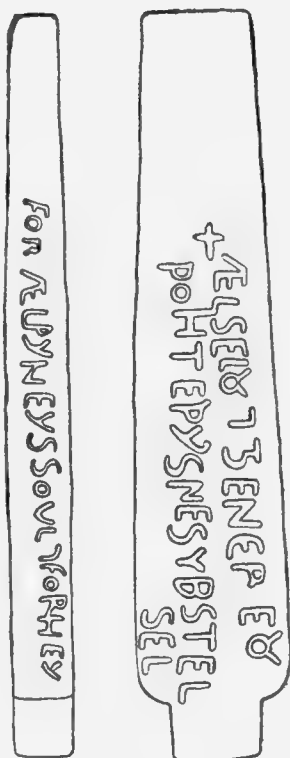


FIG. 40.

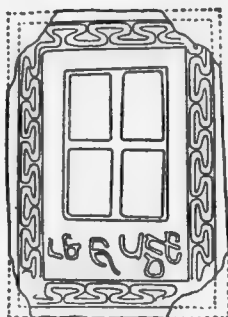


FIG. 41.



FIG. 42.

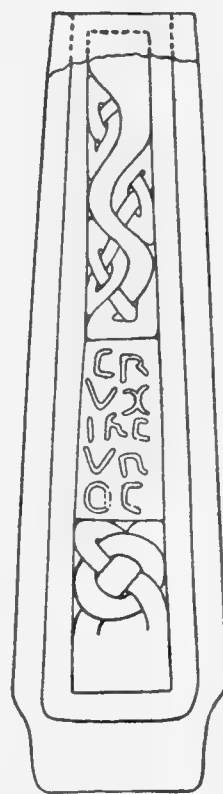



FIG. 43.

Scale, $\frac{1}{2}$ linear.

Fig. 37. Sancreed, No. 2.—Fig. 38. Doydon—Fig. 39. Gulval—Fig. 40. Lanteglos by Camelford—Fig. 41. Pendarves—Fig. 42. Trevena—Fig. 43. Waterpit Down.

EARLY CHRISTIAN MONUMENTS

SOUTH HILL.—Rude pillar stone standing in the rectory garden. Discovered by the late S. J. Wills, of St. Wendron, on 3 September, 1891, in rockery of vicarage garden. The inscription is in two vertical lines surmounted by the Chi-Rho monogram:  CVMREGNI FILI MAVCI. (Plate III, fig. 25.)

TAWNA.—See CARDINHAM (3).

TINTAGEL.—Ornamented cross standing in garden in front of the Wharnccliffe Arms Hotel, in Trevena.¹ Found in 1875 by J. J. E. Venning; in use as a gatepost at Trevillet. On the front is the inscription MATHEUS MARCVS LVCAS IOH̄, and on the back ÆLNAT + FECIT HĀC CRVCEM P[RO] A[N]IMA SŪ. (Plate VI, fig. 42.)

TREVENA.—See TINTAGEL.

TREVEKEAGE.—See ST. HILARY (2).

WELLTOWN.—See CARDINHAM (4).

CROSSES

It will be easily understood that in these pages it is quite impossible to deal fully with the subject of the Cornish crosses. In the summary on p. 426 it has been shown that they can be reckoned not by scores but by hundreds. In this connexion it is worth mentioning that since 1896 fifteen stones have been brought to light, including one or two that had been previously entered as ‘missing.’ Under these circumstances it will be more interesting to illustrate the different types of crosses as far as possible by the new finds rather than by those which have been already published, in order that they may appear here for the first time.²

It has always been a more or less difficult question to determine for what purpose the majority of the crosses were erected, as by far the greater number of them are dotted about on the bleak moors, and when set up must have been far from any habitation. There can, however, be little doubt that many of them were erected in certain positions as guides or landmarks across the county in the days when Cornwall was an almost trackless waste. Even at the present time many of them are to be found *in situ* by the roadside, thus showing that from time immemorial the old cross tracks have been preserved, and the now accepted term of ‘wayside cross’ has been applied to those which are thus situated. Another reason for their presence is that, like the churchyard crosses, many were erected for devotional purposes or praying stations. Of this fact there is ample evidence, but a single instance in support of this statement will be sufficient for the purpose. In cap. 3 of the *Hodae Gloricon of St. Willibald*,³ c. 754, is the following passage:—

And when his parents in great anxiety of mind were held in suspense as to the death of their son, they made an offering of him before the great cross of Our Lord and Saviour. For it is the custom of the Saxon race that on many of the estates of nobles and of good men they are wont to have, not a church, but the standard of the holy cross dedicated to the Lord and revered with great honour, lifted up on high so as to be convenient for the frequency of daily prayer.

¹ Trevena is the name of the village of Tintagel.

² The following list contains the new illustrations:—*Allen, St.*—In churchyard, fig. 66, Trefro-nick, fig. 79; *Altarnun*—Halvinney Moor, fig. 81; *Blisland*, Tregaddick, fig. 82; *Enoder, St.*—In churchyard, fig. 89; *Lanivet*—Laninval, fig. 52; *Lelant*—Cairn, fig. 56; *Roche*—Trerank, fig. 77; *Stephen-in-Brannel, St.*—In churchyard, fig. 53; *Tresmeer*—In church porch, fig. 71; *Winnow, St.*—Higher Coombe, pl. vii, fig. 50.

³ Translated by Canon Brownlow, D.D.

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In those cases, however, where the churchyard and other crosses bear inscriptions the object is different, as they are thus shown to be commemorative.

With regard to the geographical distribution of the crosses, they are as a whole more numerous in the west of the county, and, like the inscribed stones, gradually diminish in number towards the east, the north-east of the county being practically devoid of them.

The material of the crosses is almost exclusively moorland or surface granite, but in a few cases grey or white elvan¹ has been employed and has proved to be an infinitely better material.

Very little had been done up to recent years in recording or illustrating the Cornish crosses. In the *Gentleman's Magazine* for 1805 is a curious plate² illustrating eleven 'Ancient Crosses in Cornwall,' but the sketches are very poor and convey little idea of the originals. The brief letterpress is interesting, and the article has resulted in the discovery of 'Kill Boy' Cross, referred to in it, which had been missing for years. Samuel Lysons, in his *Magna Britannia*, vol. iii (1814), produced a plate illustrating those at Temple Moor, Roche churchyard, one in Sancreed churchyard, and Lanherne; he also mentions the two in Lanivet churchyard, and describes the inscribed cross-base at Redgate.

J. T. Blight's *Crosses and Antiquities of Cornwall* (1852-8) was up to that time the most complete work on the subject. He illustrated 107 of the early crosses and mentioned the existence of some sixty others. Not the least valuable portion of his book lies in the information giving the position of several of the stones, as some have since been moved and others have entirely disappeared.

There are good illustrations of some of the crosses, drawn by the Rev. W. Jago, of Bodmin, in Sir John Maclean's *Deanery of Trigg Minor* (1868-79).

In 1896 my *Old Cornish Crosses* was published, containing 281 illustrations of the crosses and descriptions of nearly sixty others. By means of rubbings most of the interlaced ornament, etc. upon them, hitherto unknown, was revealed. The book also contains illustrations of the coped stones, and early cross slabs.

Since 1845 several papers on the crosses have appeared from time to time in the journals of various archaeological societies, amongst which may be mentioned *Archaeologia Cambrensis*, the *Archaeological Journal*, and the *Journal of the British Archaeological Association*.

The crosses may be divided broadly into two classes, Unornamented and Ornamented. Coped stones and early cross slabs, both of which belong to the same period, may be taken with the crosses, and it will be expedient to define the types, giving lists illustrating typical examples of each kind under consideration, arranging them in order according to their state of development. But it must be clearly understood at the outset that no two crosses are exactly alike: they simply possess certain

¹ Elvan is the local name for trap dykes.

² *The Catholick Miscellany* of February, 1827, reproduced almost the same plate, omitting one stone.



FIG. 45.

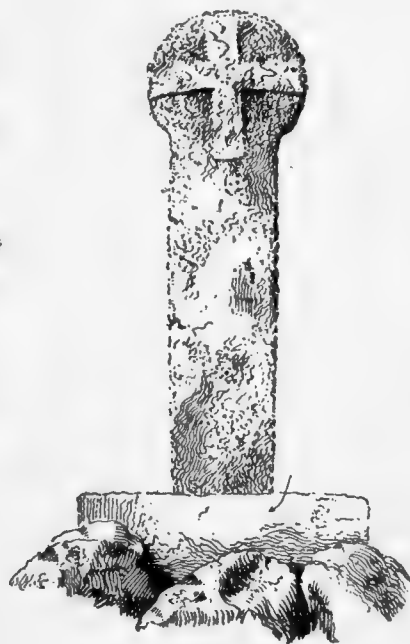


FIG. 46.



FIG. 47.



FIG. 48.

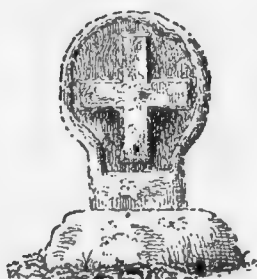


FIG. 49.



FIG. 50.

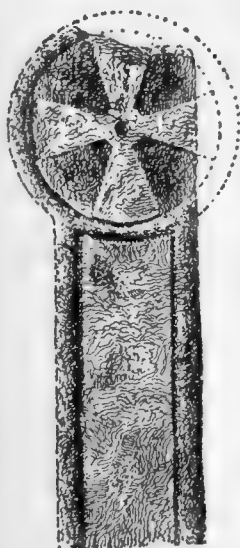


FIG. 51.



FIG. 52.



FIG. 53.

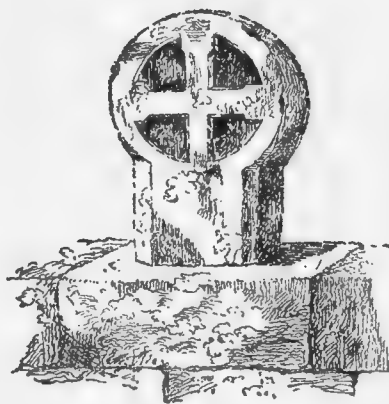


FIG. 54.

Scale, $\frac{1}{12}$ actual size.

TYPES OF WHEEL CROSSES.

Fig. 45. Rosepletha, St. Levan—Fig. 46. Enys, St. Gluvias—Fig. 47. Withiel, by roadside—Fig. 48. Luxulian, in churchyard—Fig. 49. Gunwalloe—Fig. 50. Higher Coombe, St. Winnow—Fig. 51. Polrode Mill, St. Kew—Fig. 52. Lanival, Lanivet—Fig. 53. St. Stephen-in-Brannel, in churchyard—Fig. 54. St. Levan, on churchyard wall.

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features sufficiently similar to enable them to be placed in groups, and the order in which they are taken is quite irrespective of their age. As a matter of fact, the wheel crosses with little incised crosses on their heads are probably the oldest.

CLASS I.—UNORNAMENTED CROSSES

I.—UPRIGHT SLABS AND PILLARS WITH CROSSES IN RELIEF UPON THEM

Crosses of this type are taken first as being the rudest and simplest. At the same time attention should be called to the labour expended in sinking the whole surface of the stone surrounding the cross. There are six examples of this type,¹ viz. :—

Burian, St.—Tregurno Down, Trevorrian ; *Camborne*—In the church ; *Columb Minor, St.*—Cross Close ; *Sancreed*—Lower Drift (fig. 44) ; *Sennen*—Escalls.

The remainder are more or less similar to that illustrated, except in the case of Cross Close, which is cylindrical.

2.—WHEEL CROSSES

Wheel crosses, locally called ‘round-headed crosses,’ come next in order of development and are met with in far greater numbers than any other kind. They have an approximately circular head of a diameter greater than the width of the shaft, and are treated in every conceivable manner, from those having simple crosses on their heads, to such ornate examples as the North cross in Lanivet churchyard, that at Eastbourne,² Sussex, and elsewhere.

(a) *With equal-limbed crosses in relief upon the head*

Advent—Tresinney ; *Agnes, St.*—In churchyard ; *Altarnun*—In churchyard ; In vicarage garden ; Two gates ; *Blisland*—In churchyard, Trewardale (2) ; *Boconnoc*—In churchyard ; *Bodmin*—Berry Tower, Outside gaol, Over a well in a field, Callywith ; *Breock, St.*—White Cross ; *Breward, St.*—Lanke (2), Penvorder ; *Budock*—Nangitha ; *Burian, St.*—Boskenna, in a field ; *Camborne*—In church wall ; *Cardinham*—Treslay Down ; *Constantine*—In churchyard ; *Eglosbayle*—In churchyard (2) ; *Ewe, St.*—Corran ; *Forrabury*—Outside churchyard ; *Gluvias, St.*—Enys (fig. 46) ; *Gunwalloe*—In churchyard (fig. 49) ; *Gwinear*—In churchyard, No. 1 ; *Helston*—In churchyard ; *Hilary, St.*—Trehwela Lane ; *Juliot, St.*—In churchyard, No. 1 ; *Kew, St.*—Polrode Mill (fig. 51) ; *Lanivet*—Bodwannick, Fenton Pits, Ingonger, Lanival (fig. 52), Tremoor Cross, Woodley Cross ; *Lanlivery*—Trethew ; *Lanteglos by Camel-ford*—In churchyard, No. 1, Trewalder, Trevia, No. 1 ; *Lewan, St.*—On churchyard wall (fig. 54), Rosepletha (fig. 45), Sawah ; *Linkinborne*—North Coombe ; *Luxulian*—In churchyard, (fig. 48), Lockingate, Methrose ; *Mabyn, St.*—In churchyard, Colquite, Cross Hill ; *Madron*—Hea Moor, Trengwainton Cairn ; *Mawgan in Pyder*—In churchyard ; *Mawnan*—In church wall ; *Merther*—Tresillian ; *Michaelstow*—Trevenning, No. 1 ; *Minver, St.*—St. Enodoc ; *Roche*—In rectory garden ; *Ruan Minor*—St. Rumon's Cross ; *Sancreed*—On churchyard wall, In churchyard wall, Anjarden ; *Sennen*—On churchyard wall ; *Stephen in Brannel, St.*—In churchyard (fig. 53) ; *Thomas the Apostle, St.*—In churchyard ; *Trevalga*—In churchyard ; *Tywardreath*—Tregaminion, No. 1 ; *Warbstow*—Lower Youlton ; *Wenn, St.*—Cross and Hand ; *Winnow, St.*—Higher Coombe (fig. 50), Waterlake Cross ; *Withiel*—By roadside (fig. 47), In rectory garden.

b (1) *With a central sinking at the intersection of the limbs on the cross head*

Cubert, St.—In churchyard ; *Illogan*—In churchyard.

b (2) *With a central boss as last*

Lelant—In churchyard ; *Tintagel*—Bossiney.

Plate No. VII gives some examples of wheel crosses.

¹ Except where otherwise stated all the illustrations of the crosses are drawn to $\frac{1}{2}$ inch scale, or $\frac{1}{24}$ actual scale.

² This cross was brought from St. Erth to Eastbourne in 1817. See *Old Cornish Crosses*, p. 303.



FIG. 44.



FIG. 55.



FIG. 56.



FIG. 57.



FIG. 60.

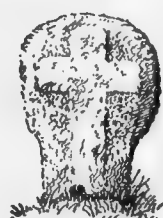


FIG. 59.

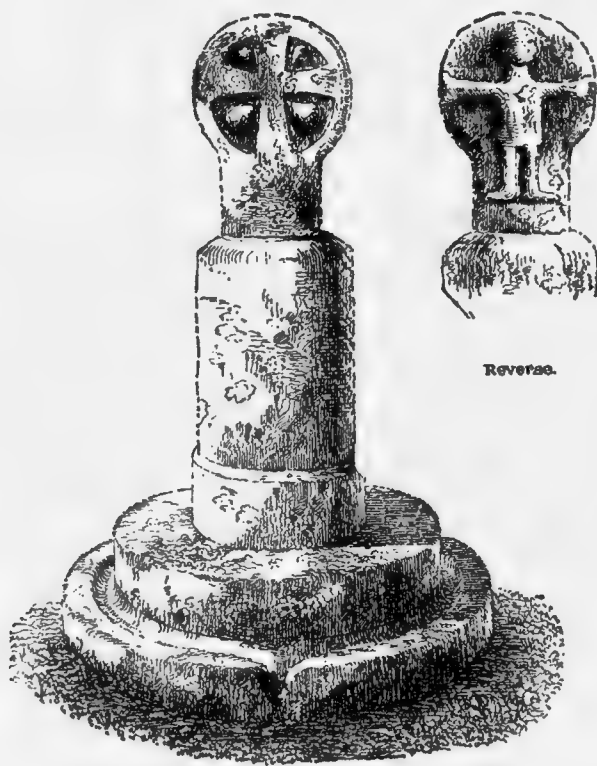


FIG. 58.

Reverse.

UPRIGHT SLABS, WHEEL CROSSES WITH LATIN CROSSES, AND CROSSES WITH THE FIGURE OF OUR LORD.

Fig. 44. Lower Drift—Fig. 55. Kenidjack, No. 1—Fig. 56. Cairn—Fig. 57. Tredorwin—Fig. 58. Boskenna Cross—Fig. 59. Trevorgans—Fig. 60. Trebehor.

A HISTORY OF CORNWALL

PLATE IX



FIG. 61.

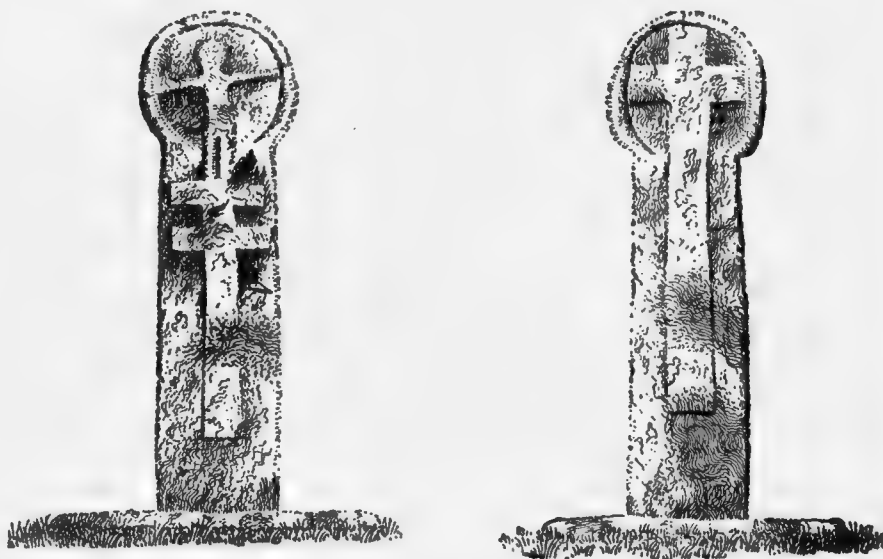


FIG. 62.

CROSSES WITH THE FIGURE OF OUR LORD

Fig. 61. Ripper's Mill—Fig. 62. Trevease.

EARLY CHRISTIAN MONUMENTS

(c) *With a Latin Cross or Crosses in relief, the upper limbs contained in the head*

Breage, St.—Trevena; *Burian, St.*—Boskenna Gate Cross; *Camborne*—Trevu, No. 1; *Halsetown*—In village; *Helston*—In a garden; *Just in Penwith, St.*—Kenidjack (2) (fig. 55), Nanquidno; *Keverna, St.*—Trelanvean; *Lanteglos by Camelford*—Tregoodwell; *Lelant*—Cairn (fig. 56), Sea Lane; *Ludgvan*—In churchyard; *Mabe*—In vicarage garden; *Madron*—Boswarthen; *Paul, St.*—In vicarage hedge; *Pendeen*—In vicarage garden; *Sennen*—In cemetery, Sennen Green; *Stithians*—In vicarage garden; *Towednack*—Tredorwin (fig. 57); *Warleggon*—In churchyard; *Zennor*—In churchyard.

(d) *With the figure of our Lord in relief on the front of the head, and a cross on the back*

As a rule the figure is shown alive upon the cross, according to the Byzantine fashion, clothed in a tunic, the limbs being extended perfectly straight along the three arms, while the head rests unbent against the fourth. Some other ways in which our Lord is depicted may be seen in *Old Cornish Crosses*, 120.

There are altogether forty-seven examples, of which about one half occur on unornamented crosses, and the rest on ornamented crosses.

Burian, St.—Boskenna Cross (fig. 58), In Churchtown, Trevorgans (fig. 59); *Camborne*—Pendarves, No. 1; *Constantine*—Trevease (fig. 62); *Crowan*—Clowance (2), Praise-an-beeble; *Day, St.*—Scorrier, No. 1; *Erth, St.*—In churchyard, In Churchtown; *Feock, St.*—In churchyard; *Gulval*—Rosemorran; *Gwennap*—In vicarage garden; *Gwinear*—In churchyard, No. 2; *Lelant*—In cemetery (2); *Levan, St.*—Trebehor (fig. 60); *Ludgvan*—White Cross; *Michael's Mount, St.*—On west side; *Phillack*—In churchyard, No. 1; *Stithians*—Repper's Mill (fig. 61); *Treslothan*—Near village (missing); *Zennor*—In Vicarage garden (2).

3. CROSSES WITH PROJECTIONS AT THE NECK

This type exhibits the first development, in the introduction of an architectural feature on a plain wheel cross, whereby the form of its outline is changed.

The projections consist of a bold bead running from front to back of the stone on either side of the neck, i.e., the junction of the head and shaft. It is a quaint and curious type, and being peculiar to the county may be called, *par excellence*, the Cornish Cross.

There are altogether thirty-one examples of this type, an inclusive list of which is given below. Some of them, however, possess certain additional characteristics which place them in other groups, and to distinguish the latter from those now under consideration, they have been marked with an asterisk.

Allen, St.—In churchyard (fig. 66), Trevalsa; *Altarnun*—Trekennick; *Boconnoc*—On Druid's Hill; *Bodmin*—Carminnow*; *Camborne*—In churchyard,* Outside the Institute*; *Cleer, St.*—The Longstone*; *Clether, St.*—On Basil Barton, 4, viz., No. 1, by Inney Bank (fig. 63). No. 2, near Basil farmhouse. No. 3, Cross gates. No. 4, near Tarret Bridge; *Davidstow*—Trevivian; *Day, St.*—Scorrier, in grounds,* No. 2; *Eastbourne (Sussex)*—In Manor House grounds*; *Eglosayle*—'Three-hole-Cross'*; *Gwinear*—On Connor Down*; *Gwithian*—In churchyard; *Juliot, St.*—In churchyard, No. 2 (fig. 64); *Laneast*—On Laneast Down; *Lanteglos by Camelford*—In churchyard (2); *Lesnewth*—In churchyard; *Lewannick*—Holloway Cross (fig. 65), Trelaske*; *Mylor*—In churchyard*; *Penzance*—In Library garden*; *Perranzabuloe*—On Perran Sands*; *Phillack*—In a field; *Roche*—In churchyard*; *Wendron, St.*—In Mrther Uny old churchyard.*

The simpler forms of this type are all pretty much alike, varying chiefly in the form of the cross on the head, or the shape of the space containing it.

Three examples in the foregoing list have the addition of a central boss on the head, viz. :—

Boconnoc—On Druid's Hill; *Gwithian*—In churchyard; *Lanteglos by Camelford*—In churchyard; and in the last named there are four more bosses, one in each of the spaces between the limbs of the cross and the bead on the edge of the head.

There is a unique example at New Park, St. Clether (fig. 67), where in addition to the projections at the neck there is a rectangular projection on the top of the head.

A HISTORY OF CORNWALL

PLATE X



FIG. 63.

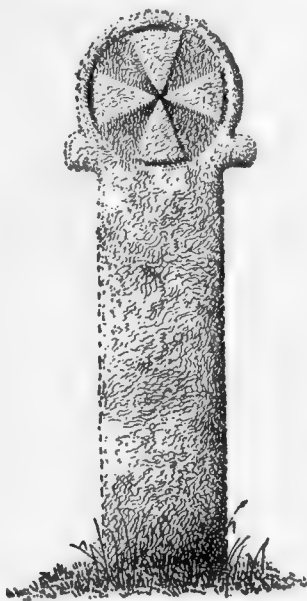


FIG. 64.

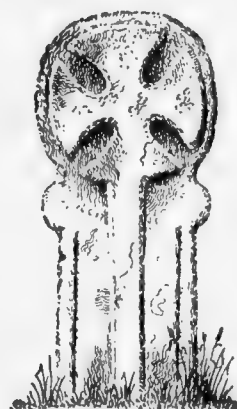


FIG. 65.

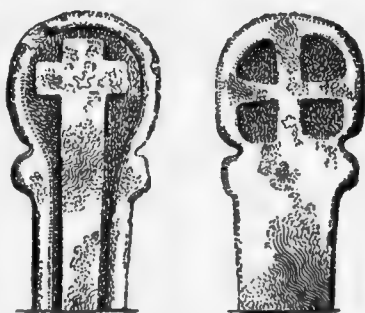


FIG. 66.



FIG. 77.

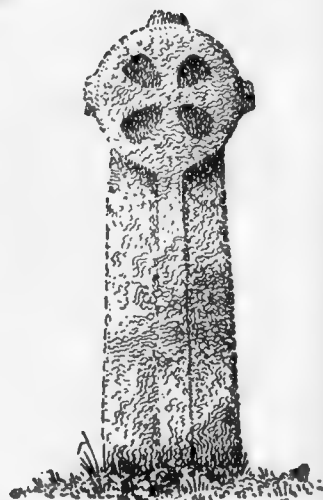


FIG. 68.



FIG. 67.



FIG. 76.



FIG. 75.

CROSSES WITH PROJECTIONS AT THE NECK, ETC., AND LATIN CROSSES.

Fig. 63. Basil, No. 1—Fig. 64. St. Juliot, No. 2—Fig. 65. Holloway Cross—Fig. 66. St. Allen—Fig. 67. New Park—Fig. 68. Treslea Cross—Fig. 75. St. Minver—Fig. 76. Carlanken—Fig. 77. Trerank.



FIG. 69.

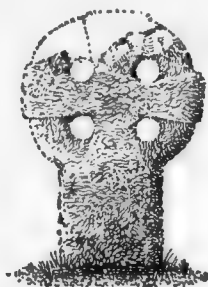


FIG. 70.

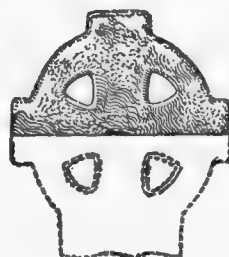


FIG. 71.



FIG. 73.



FIG. 74.

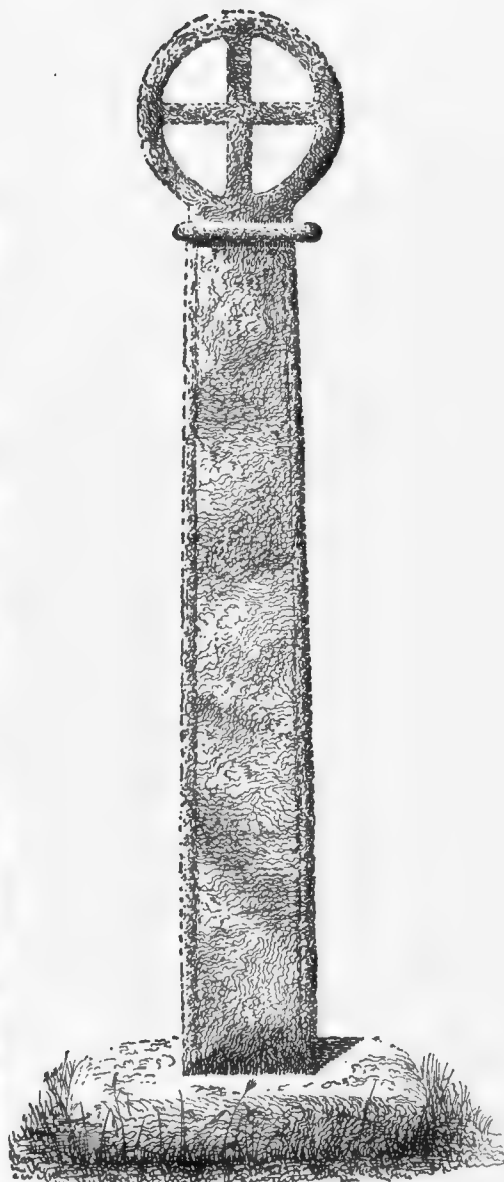


FIG. 72.

HOLED CROSSES

Fig. 69. Three-hole Cross—Fig. 70. Trevenning Cross—Fig. 71. Tresmeer—Fig. 72. Michaelstow—Fig. 73. St. Wendron—Fig. 74. Pencarrow.

A HISTORY OF CORNWALL

4. WHEEL CROSSES WITH CRUCIAL PROJECTIONS¹

The distinctive feature of this type consists in the addition of three rectangular projections extending beyond the rounded head.

There are four examples, viz. :—

Blisland—St. Pratt's Well, Peverell's Cross ; *Cardinham*—In churchyard, No. 1, Treslea Cross (fig. 68). See also type 5 (c).

5. HOLED CROSSES

This term is applied to those crosses which have two, three, or four holes between the arms and ring of the head. With the exception of the cross in Phillack churchyard, which has only the two upper holes pierced, and the two crosses at Egloshayle (fig. 69) and Perranzabuloe, which have three,² all have four holes, and are locally called 'Four-hole Crosses.'

There are altogether twenty-eight examples of four-holed crosses, of which the following thirteen are unornamented.

Burian, St.—In churchyard ; *Egloshayle*—Pencarrow ; *Erth, St.*—In churchyard, No. 1 ; *Laneast*—In church ; *Lanhydrock*—Lanhydrock Park ; *Lawhitton*—Treniffle ; *Lewannick*—Trelaske ; *Michaelstow*—In churchyard ; *Padstow*—In churchyard, No. 1 ; *Paul, St.*—On churchyard wall ; *Tresmeer*—In church porch ; *Tudy, St.*—Trevenning Cross ; *Wendron, St.*—In churchyard.

In monuments of this kind the limbs of the cross are connected by a ring, which is slightly recessed from the face, and kept within the extremities of the limbs. The four holes, which are in a few cases circular, are pierced through the triangular spaces left between the limbs of the cross and the inside line of the ring. As a rule the sides of the spaces are first splayed inwards for a short distance from front to back, and the remaining portion is pierced. The lower limb of the cross is, in all cases, larger than the others.

These crosses may be classified as follows :—

(a) *Plain Crosses with no beads on the Head*

Laneast—In church ; *Lanhydrock*—In Lanhydrock Park ; *Tudy, St.*—Trevenning Cross (fig. 70).

(b) *With beads on the Head and Projections at the Neck*

Lewannick—Trelaske. Only the head of this cross now remains.

(c) *With Crucial Projections*

Tresmeer—In church porch. The only known specimen of the type (fig. 71).

(d) *With an abacus, or projecting bead surrounding the Neck*

The four holes in the head are very large, and occupy the whole of the space between the ring and the equal limbed cross within. The type is not found out of the county.

Lawhitton—Treniffle ; *Michaelstow*—In churchyard (fig. 72).

The cross at Michaelstow is a very fine example, and stands 11 ft. 3 in. high, while that at Treniffle is only a cross-head.

(e) *With five bosses on both front and back of the Head*

Wendron, St.—In churchyard (fig. 73).

(f) *With the figure of our Lord on the front, and five bosses on the back*

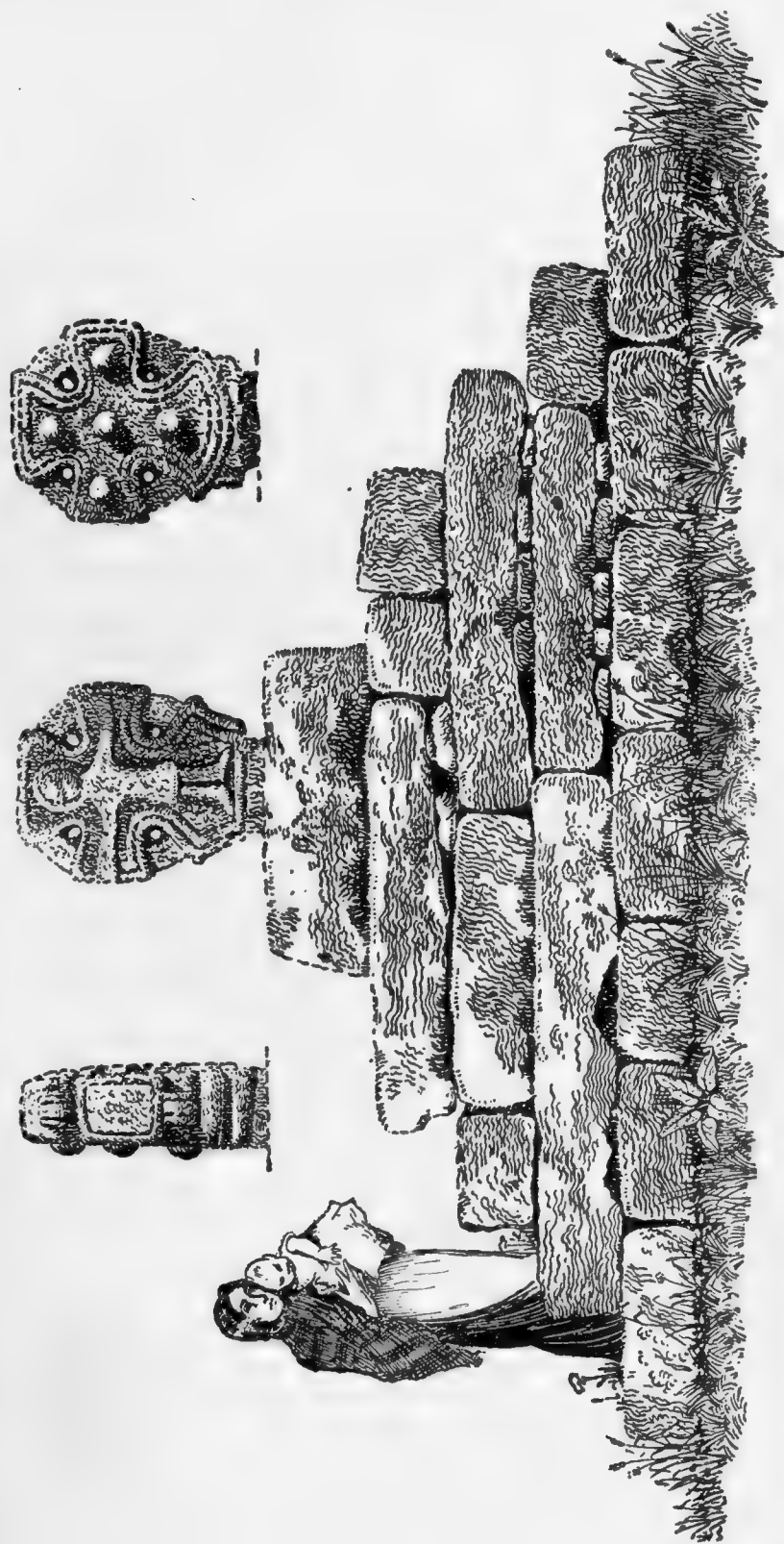
Burian, St.—In churchyard (Plate XII) ; *Erth, St.*—In churchyard, No. 1 ; *Paul, St.*—On churchyard wall.

¹ Other crosses possessing this feature will be found at Penmon, Anglesea, and on some of the West Highland crosses, as Maclean's Cross, Iona ; and Kilchoman, Islay.

² These are the only two specimens of this type at present known to exist in Great Britain. In outline they resemble type 3.

EARLY CHRISTIAN MONUMENTS

PLATE XII



CROSS IN THE CHURCHYARD, ST. BURIAN.

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(g) *With three rolls or cusps in the holes*

These cusps are formed by rounded rolls or beads, running from front to back of the stone, and projecting, one from either limb and one from each quadrant of the ring. In no case are the cusps pointed.

This treatment of the holes is another peculiarity confined to Cornwall. On some of the Irish crosses, as at Monasterboice, a single rounded projection is found on the inside of the ring, but those on the limbs are always omitted.

Eglosayle—Pencarrow (fig. 74); *Padstow*—In churchyard, No. 1.

6. LATIN CROSSES

Considering the immense number of crosses in Cornwall, it is not suprising to find that Latin crosses are more numerous in this district than in any other.

The chief characteristics of the plain Latin crosses are :—(1) In most cases the head and arms are slightly tapered towards their ends; (2) in some cases the arms are tilted upwards; and, (3) in others the arms are narrower than the head; all which details are, we believe, confined to the county. Other slight varieties are found in those with nearly circular shafts and arms, as at Davidstow and Godolphin, while that at Lavethan, No. 1, has expanded limbs.

There are altogether about thirty-one examples which may be classified as follows :—

(a) *Plain Latin Crosses*

Altarnun—Opposite St. Vincent's mine; *Blisland*—Lavethan, No. 1; *Cardinham*—Pinchla; *Columb Major, St.*—Black Cross; *Davidstow*—Lambrenny; *Germans, St.*—Carracawn; *Godolphin*—Spernon Cross; *Ludgvan*—In churchyard, No. 2; *Madron*—Tremathick or Trereiffe Cross; *Minver, St.*—In churchyard (fig. 75); *Neot, St.*—In vicarage garden, No. 1; *North Hill*—Trebartha, No. 1; *Paul, St.*—Carlanken (fig. 76); *Halwyn*; *Paul Down*; *Shevioc*—Crafthole; *Temple*—In churchyard, No. 1.

(b) *With a Cross in relief on front and back*

Gleer, St.—St. Cleer's Well; *Roche*—Trerank (fig. 77); *Tresmeer*—In churchyard.

(c) *With the figure of our Lord in relief on the front*

Mawgan in Pyder—Mawgan Cross; *Newlyn (Penzance)*—Near church.

(d) *Latin Crosses of semi-Gothic character with chamfered angles*

Allen, St.—In churchyard; *Blisland*—Cross Park; *Lelant*—Lelant Lane; *North Hill*; *Kingbear*; *Pinnock, St.*—Bosent Cross; *Shevioc*—At four cross roads; *Stephen by Saltash, St.*—Trematon.

CLASS 2.—ORNAMENTED CROSSES

The ornamented crosses may be divided into four sections, as follows :—

I. MONUMENTS WITH INCISED CROSSES, OR WITH INCISED ORNAMENT

(a) *Incised Crosses or Wheel Crosses*

Allen, St.—Trefronick (fig. 79); *Altarnun*—Halvinney Moor (fig. 81); *Blisland*—Lavethan (2); *Breward, St.*—Middlemoor; *Budock*—In churchyard (2) (fig. 80); *Camborne*—Pendarves, No. 2; *Ives, St.*—Penbeagle; *Just in Penwith, St.*—In vicarage garden, No. 1; *Michaelstow*—Travenning (2); *Neot, St.*—Newtown; *Phillack*—Copperhouse; *Sancreed*—Trenuggo Hill (fig. 78); *Wendron, St.*—Boderwannack, Manhay Vean.

(b) *On Latin Crosses*

Austell, St.—In churchyard; *Blisland*—Lavethan, No. 4, Tregaddick (fig. 82); *Brad-dock*—Kill-boy-Cross; *Godolphin*—In churchyard; *Lansallos*—In churchyard; *Neot, St.*—In vicarage garden (2) (fig. 83), Hilltown (fig. 84), in the village; *North Hill*—Trebartha, No. 2; *Temple*—In churchyard (3).

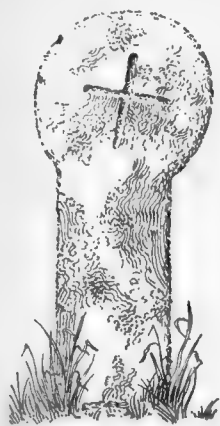


FIG. 78.

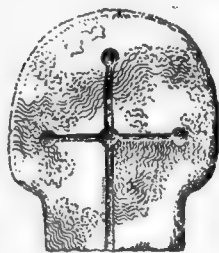


FIG. 79.



FIG. 80.

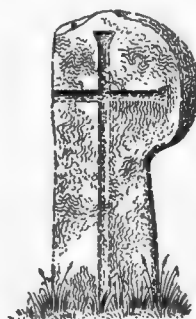


FIG. 81.



FIG. 82.

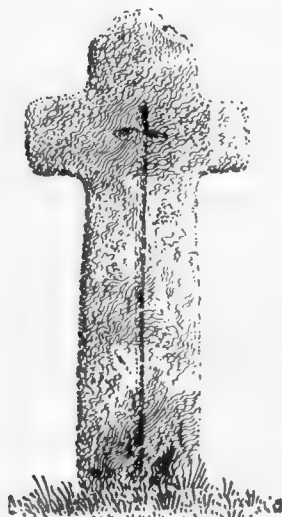


FIG. 83.

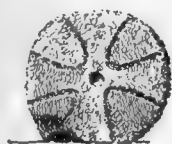


FIG. 85.



FIG. 84.



FIG. 86.



FIG. 88.



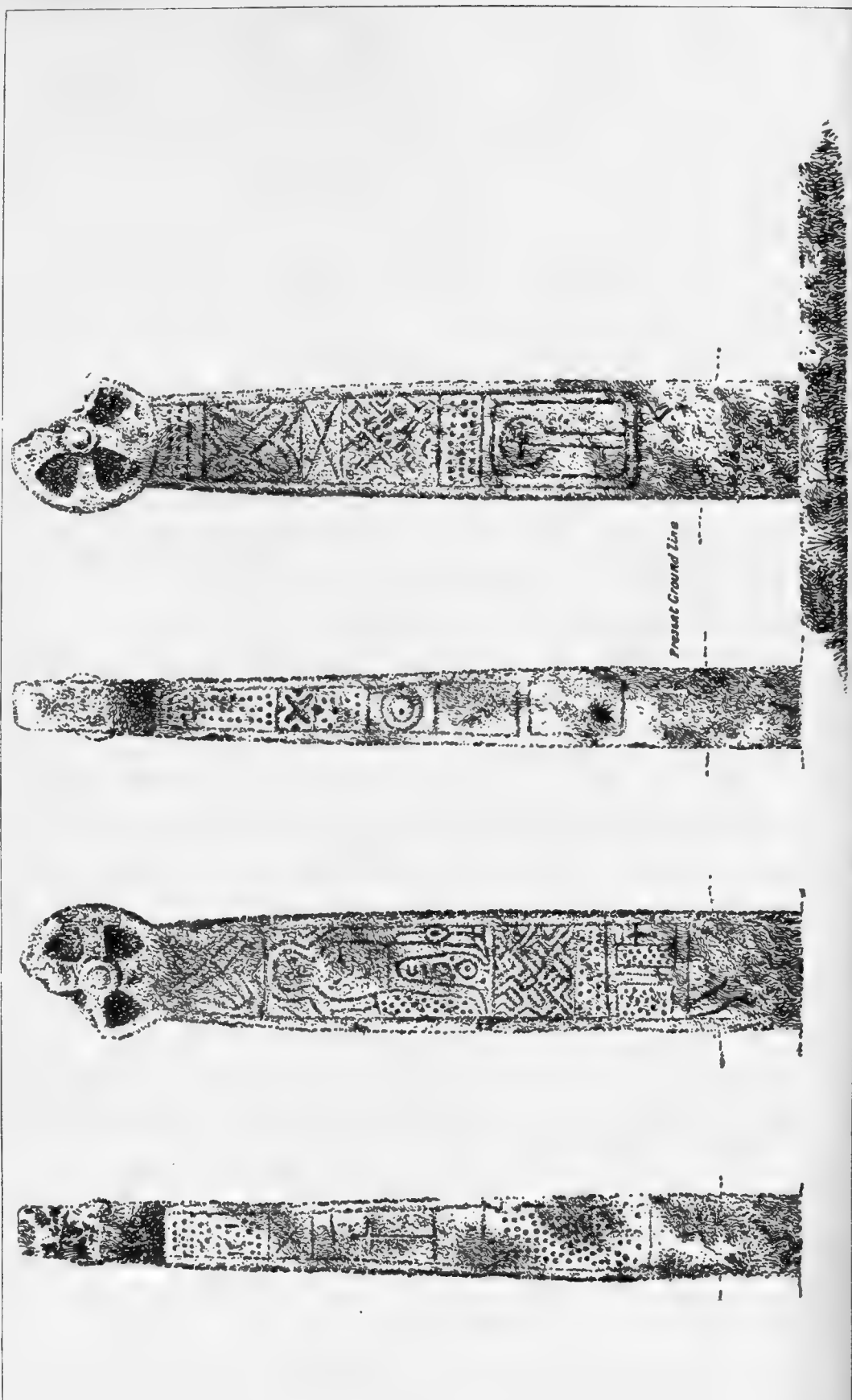
FIG. 87.

INCISED CROSSES.

Fig. 78. Treauugo Hill—Fig. 79. Trefronick—Fig. 80. Budock, No. 2—Fig. 81. Halvinney Moor—Fig. 82. Tregaddick—Fig. 83. St. Neot, No. 3—Fig. 84. Hilltown—Fig. 85. Helston—Fig. 86. Vellansajer—Fig. 87. Tregullow, No. 2—Fig. 88. Trevu, shows the figure incised

A HISTORY OF CORNWALL

PLATE XIV



Cross No. 1 in the Churchyard, Lanivet.

EARLY CHRISTIAN MONUMENTS

(c) *Similar to the foregoing, but with the figure of our Lord in relief on the front*
Burian, St.—Chyoone.

(d) *Incised crosses in outline or partly in outline, the remainder being in relief.* All the examples occur on wheel crosses.

Day, St.—Tregulow, No. 1 (fig. 87); *Burian, St.—Vellansajer* (fig. 86); *Constantine—Bosvathick, Merthen*; *Cury—In churchyard*; *Feock—Trelissick*¹; *Gerrans—In churchyard*; *Helston—Cross Street* (fig. 85); *Hilary, St.—In churchyard*; *Just in Penwith, St.—In vicarage garden, No. 2*; ¹*Landewednack—Lizard Town*; *Lanlivery—No-Man's-Land*; *Ludgvan—In churchyard, No. 3, Crowlas*; *Madron—In churchyard*; ¹*Sancreed—Brane*; *Tywardreath—Tregaminion, No. 2*; *Wendron, St.—Merther Uny Cross.*

(e) *Incised Crosses with simple ornament*

Breward, St.—Deaconstow; *Carmenellis—In churchyard*; *Constantine—Trewardreva*; *Mullion—Pradannack*; *Perranarworthal—In vicarage garden*; *Wendron, St.—Trevethick.*

(f) *With the figure of our Lord incised*

Camborne—Trevu, No. 2 (fig. 88); *Flushing—In churchyard*; *Sennen—Trevilly.*

Incised Ornament

The simplest forms of incised work in Cornwall consist of straight lines, zig-zags, curved lines, rude scroll-work, and the like; most of which are roughly executed. Of all the different devices which are employed to decorate a surface, the most common, and at the same time most curious, consists of a number of little conical holes or dots, which we believe are not found out of the county. They are placed either in horizontal or diagonal rows, or indiscriminately distributed over the surface, but are always close together, and as a simple method of ornamentation are very effective. Three crosses are entirely decorated with them, viz.: in the Library garden at Penzance, on Connor Down, Gwinear, and the three-holed cross on Perran Sands, Perranzabuloe. In the first and last cases they are arranged in fairly regular rows in panels, while in the other they are best described as being placed 'anyhow,' similar to those on the right side of one of the crosses in Lanivet churchyard, seen on Plate XIV. In addition to their local decoration, they all possess the unique Cornish feature of projections at the neck.

(g) *On Wheel Crosses*

Altarnun—Tresmeake Bridge; *Boconnoc—In Boconnoc Park*; *Cardinham—Higher Deviock*; *Dennis, St.—In churchyard*; *Lanivet—In churchyard, No. 1* (Plate XIV); *Lanteglos by Camelford—Trevia, No. 2*; *Levan, St.—In churchyard No. 2*; *Tywardreath—Menabilly.*

Plate XIV is perhaps the best example of its type.

(h) *On Wheel Crosses with Projections at the Neck*

Camborne—In churchyard; *Cleer, St.—On St. Cleer Common*; *Eastbourne*² (*Sussex*)—*In Manor House grounds*; *Gwinear—On Connor Down*; *Penzance—In Library garden.*

A sixth example, outside the Institute at Camborne, has the figure of our Lord in relief upon it.

(i) *On a Three-holed Cross, with Projections at the Neck*

Perranzabuloe—On Perran Sands.

(j) *On a Four-holed Cross, with Projections at the Neck*

Bodmin—Carminnow Cross.

(k) *On a Latin Cross*

Madron—Boscathnoe.

2. MONUMENTS WITH SUNK CROSSES, OR WITH SUNK ORNAMENT

(a) *On a Pillar Stone*

Wendron, St.—Bodilly.

¹ Has figure of our Lord in relief on the front.

² See footnote, p. 426.

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(b) *On Wheel Crosses*

Burian, St.—Crowz-an-wra, Nûn Careg; *Constantine*—Nanjarrow; *Crowan*—Clowance, No. 3; *Helston*—In a garden, No. 2 (fig. 91); *Mabe*—Helland; *Madron*—Trembath; *Temple*—In churchyard, No. 2.

(c) *On Wheel Crosses, with Projections at the Neck*

Day, St.—Scorrier, No. 2; *Enoder, St.*—In churchyard (fig. 89).

(d) *On a Latin cross. Menbeniot.*—Tencreek (fig. 90).

3. MONUMENTS WITH MISCELLANEOUS ORNAMENT

(a) *On Wheel Crosses*

At Washaway, Egloshayle (fig. 92) on both front and back; and at Penwine St. Mabyn, on the back only, there is a fleur-de-lis on the head in place of a cross.

At Trevean, St. Erth, the cross has on each side of the head a human head in relief, connected by a bold bead passing over the top of the cross, the chins of the heads being on a level with the neck of the cross.

The cross at Trevalis, No. 1, Stithians, has the figure of our Lord in relief, the feet resting on a boldly projecting heart. That at Trevalis, No. 2, has, beneath the figure, a beaded ring containing an incised cross.

(b) *On Wheel Crosses, with Projections at the Neck*

The cross in Mylor churchyard is by far the tallest in Cornwall, its total length being 17 feet 6 inches; but unfortunately it has been sunk nearly 7 feet in the ground.

On each of the projections at the neck is an incised circle. Just above the level of the neck is a boss surrounded by two concentric beads, forming the top of an incised panel.

On the right side of the cross in Roche churchyard there are a series of horizontal beads, and on the left side is an incised sword, with dot ornament on front and back.

On the back and right side of the cross in Merther Uny old churchyard there is a row of six short projecting beads; on the former about 5 inches long from the neck downwards, and on the latter somewhat longer. On both front and back of the shaft is a boss surrounded by a bold bead, this being the only instance of bosses in this position.

4. MONUMENTS WITH CELTIC OR HIBERNO-SAXON ORNAMENT

Blazey, St.—Biscovey* (now at Par); *Breage, St.*—† In churchyard; *Breward, St.*—‡ In cemetery; In churchtown; *Cardinham.*—In churchyard,* No. 2 (Plate XVI); *Cleer, St.*—† In churchyard, Redgate No. 1,* Redgate No. 2; *Columb Major, St.*—‡ In churchyard, No. 2 (fig. 93); *Erth, St.*—In churchyard, No. 2; *Gulval*—In churchyard*; *Gwennap*—In church wall (concealed); *Just in Penwith, St.*—In church wall; *Lanhydrock*—† In churchyard; *Lanivet*—† In churchyard, No. 2; *Mawgan in Pyder*—Lanherne*; *Minster*—Waterpit Down*; *Minver, St.*—† In St. Michael's churchyard; *Neot, St.*—In churchyard (Plate XVII), † Four-hole-cross; *Padstow*—In churchyard, No. † 1 and No. 2. † Prideaux Place; *Phillack*—† In churchyard, No. 2; *Quethiock*—‡ In churchyard; *Sancreed*—In churchyard (2)*; *Teath, St.*—† In cemetery; *Tintagel*—Trevena*; *Tywardreath*—† Trenyhton.

* Inscribed. † Holed cross without cusps. ‡ Holed cross with cusps.

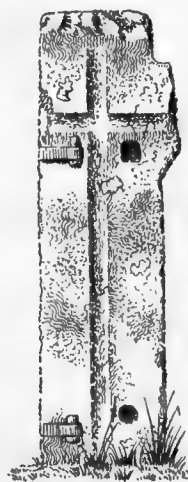
The well known 'Four-hole-Cross' on Temple Moor shows two methods of decoration, incised and Hiberno-Celtic. The letters ^G_{E W} on the front are merely the initials of a land-owner, and an instance of the manner in which the Cornish monuments were mutilated. The crosses at St. Breage and St. Minver are only cross-heads with a small portion of the shaft attached, while that at St. Cleer, found as recently as the year 1904, is merely a fragment, with only two holes remaining. The cross at Tywardreath¹ is similar to the two former, but has more of its shaft remaining; it is much mutilated, and the only ornament now distinguishable is a short piece of square key-pattern on either side of the shaft, with perhaps a triquetra knot on one arm.

The cross in St. Breward cemetery is only a portion of a cross-head, having lost its lower limb and both adjoining parts of the ring.

¹ Illustrated in the *Cornish Mag.* i (1898), 74.



FIG. 89.



Section

FIG. 90.

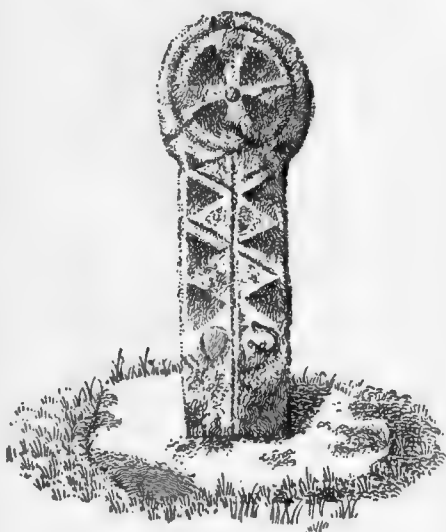


FIG. 91.

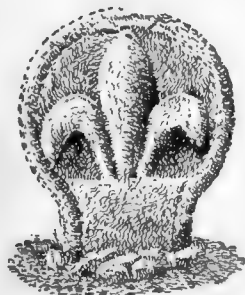


FIG. 92.



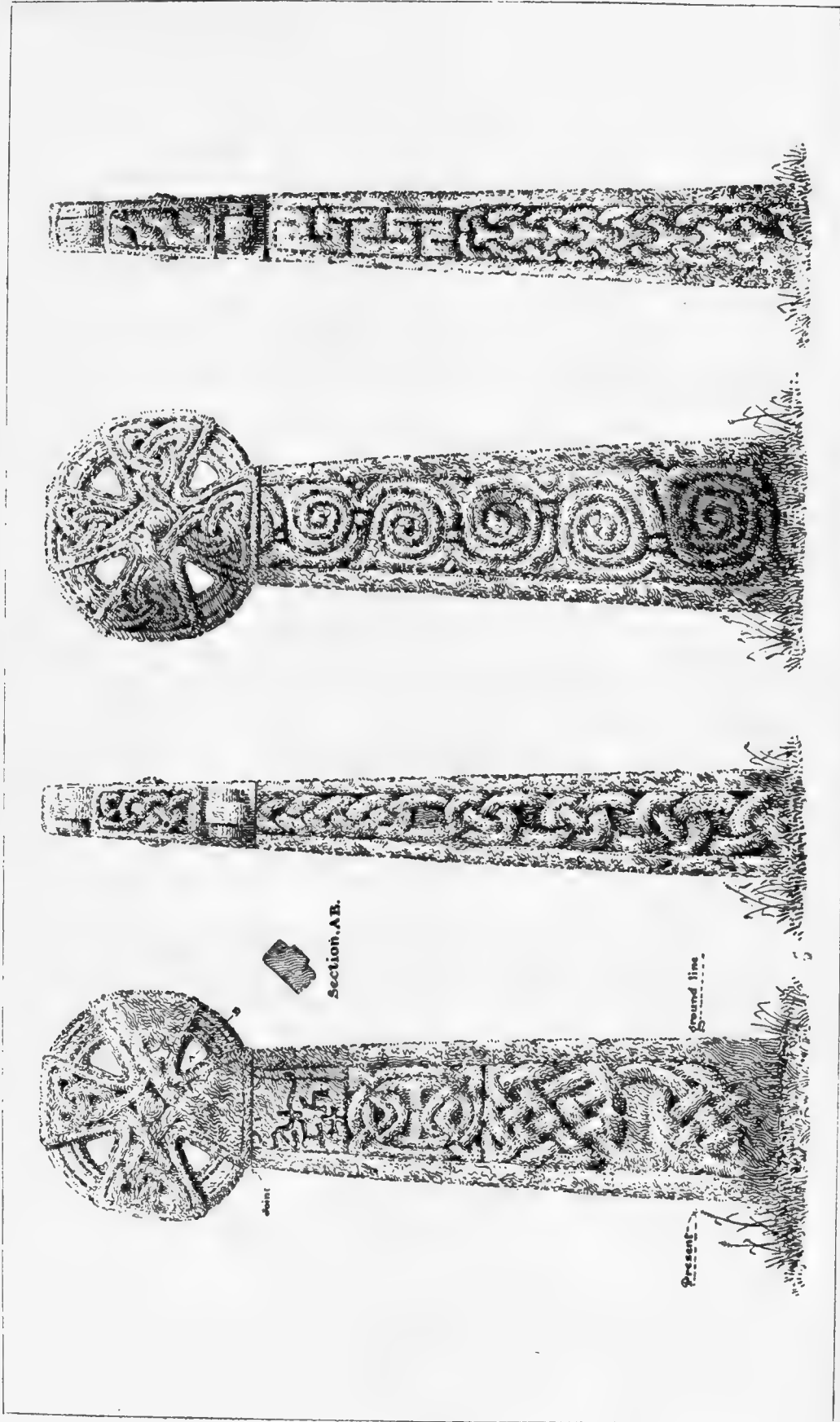
FIG. 93.

SUNK CROSSES ; SUNK, MISCELLANEOUS, AND CELTIC ORNAMENT,

Fig. 89. St. Enoder—Fig. 90. Tencreek—Fig. 91. Helston, No. 2—Fig. 92. Washaway—Fig. 93. St. Columb Major.

A HISTORY OF CORNWALL

PLATE XVI



CROSS IN THE CHURCHYARD, CARDINHAM.

EARLY CHRISTIAN MONUMENTS

The cross at St. Columb Major is a beautiful little specimen, although it now only retains about 6 inches of its shaft, and the back of the head is somewhat mutilated.

The head of the cross at Prideaux Place, Padstow, is unique, for instead of the usual ring, the limbs of the cross are connected by four straight portions set diagonally.

The Quethiock cross is a very fine one and the tallest of its kind in Cornwall, measuring 13 feet 4 inches in height from the base.

Redgate No. 2, called by Borlase and other early writers 'The Other Half Stone,' stands close to the inscribed cross-base at Redgate; only one face is decorated, and has a long panel filled with an eight-cord plait broken at the top.

St. Erth cross-shaft is mutilated and broken in two; the upper portion appears to retain the remains of the head, as part of the figure of our Lord is carved thereon.

During the restoration of Gwennap Church many years ago a portion of a granite shaft was found with interlaced work upon it; but when the foundations of a new vestry were being put in it was unfortunately re-used by the masons during the vicar's absence.

The shaft in the church wall at St. Just in Penwith¹ is unfinished, only one panel being complete, near the bottom, whilst a second is started from the top.

The St. Neot cross-shaft, Plate XVII, is the finest of all, the four sides being richly ornamented with interlaced work of different patterns.

The broken cross-shaft and base in the churchyard at Padstow, in the south-east corner, must at one time have been a very fine monument, as the shaft is 3 feet wide at the bottom, and 13½ inches thick, while its base is over 8 feet long, 5 feet wide, and 13 inches thick. There is interlaced work on the front and on both sides, and some curious ornament in relief on the back, but only 3 feet 6 inches of the shaft remains.

Writing on the ornament found on the Cornish crosses, Mr. J. Romilly Allen observes² :—

'Illustrations of the best examples of the Scotch, Irish, and Welsh monuments of a period corresponding to that when the Cornish crosses were erected are to be found in the works of Dr. J. Stuart, H. O'Neill, and Professor J. O. Westwood, so that we have no difficulty in showing what relation the crosses of Cornwall bear to those in the Celtic portions of Great Britain. But the part which was played by the Anglo-Saxons in the development of the art of these monuments has never yet been fully understood, because the English examples have never been collected together in one work, where they may be compared with each other and those elsewhere. . . .

'All the evidence with regard to the date of the monuments which has been collected tends to show that the Northumbrian crosses are of an earlier rather than of a later date than those in Ireland; and the most ancient illuminated manuscript with a really reliable date in which the so-called Celtic ornament occurs is the Lindisfarne Gospels, which is of Saxon work, and executed in Northumbria *circa* A.D. 720. My own opinion is, that . . . this style of ornament arose in consequence of the continual intercourse between the Anglo-Saxon and Celtic Christians which took place after about A.D. 650, so that the Hiberno-Saxon or Anglo-Scotic is a more appropriate title to apply to the style than Celtic or Irish. In its highest development the chief peculiarity of Hiberno-Saxon art is the combination of the following decorative elements:—(1) interlaced work; (2) key patterns; (3) spiral patterns; and (4) zoomorphic designs highly interlaced. Scrolls of foliage also occur in special areas, chiefly in Northumbria, but are entirely absent in the earlier manuscripts and on most of the sculptured stones in Wales, Ireland, and Scotland. This is not the place to discuss the origin of Hiberno-Saxon art, and we must content ourselves by saying that we look upon it simply as a local variety of the Lombardo-Byzantine style which existed in Italy, Gaul, and Britain, from say, A.D. 600 to 900, modified in each different country according to the artistic capacity of the inhabitants. . . .

'There is not much variety in the patterns of the interlaced work on the Cornish crosses, the most common knots being the figure-of-eight knot, the twist and ring, the Stafford knot, the spiral knot, and in one case the S-shaped knot.³ Oval rings, placed crosswise and interlaced, are also of frequent occurrence, sometimes combined with a double circular ring. The triquetra knot will also be found on the expanded arms of a large proportion of the crosses. The style of the interlaced work on the Cornish crosses corresponds more nearly with that on the crosses of South Wales than those of England, Scotland, or Ireland.

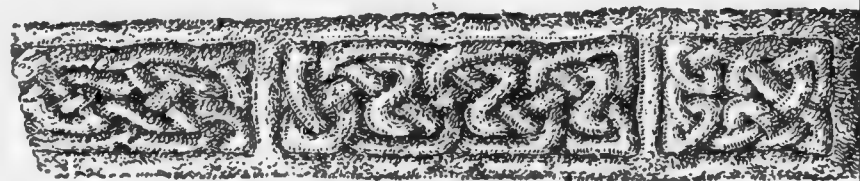
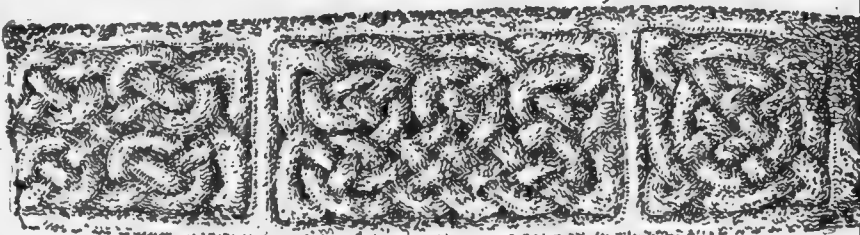
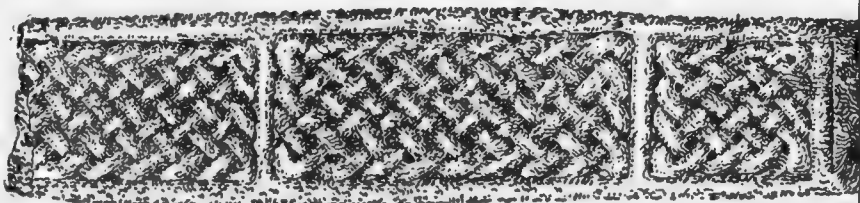
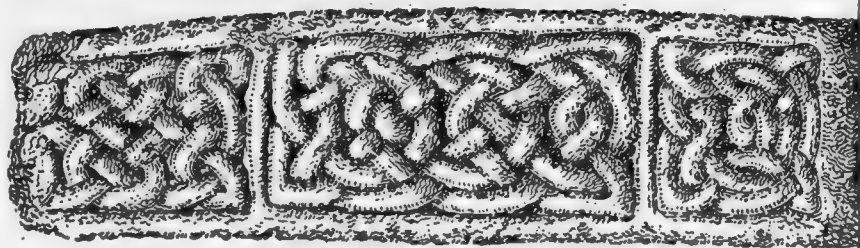
¹ *Old Cornish Crosses*, 404; also *Journ. Royal Inst. Cornwall*, vol. xiv (1900), 186.

² *Old Cornish Crosses*, 348.

³ See Pl. XVII, middle panel of first side.

A HISTORY OF CORNWALL

PLATE XVII



CROSS-SHAFT IN THE CHURCHYARD, ST. NEOT.

EARLY CHRISTIAN MONUMENTS

'The Manx chain-of-rings patterns, which is peculiarly Scandinavian, occurs on the side of the Cardinham¹ cross, being the only instance in the south or west of England. It is combined with a key-pattern composed of T's, as on the cross at Penmon, in Anglesey, which also has the ring-pattern. The ornament on the Penmon cross is akin partly to that found in North Wales and Cheshire, partly to that in the Isle of Man, and partly to that in Ireland, showing a very mixed style. It is not easy to account for the resemblance between the patterns on the Cardinham cross and those of North Wales, Cheshire, and the Isle of Man, especially as the rude scrolls of foliage on the Cardinham cross faces are purely Cornish.

'Of the key-patterns . . . there is little to be said, except that those on the Lanivet² coped stone are interesting as being identical with those on the cross-shaft at Penally in Pembrokeshire.

'As regards zoöomorphic designs, the only one which occurs on the Cornish crosses is a dragon, whose body forms a series of undulations, each filled in with a Stafford knot made by the tail.³ The same creature is to be seen on the beautiful little coped stone at Bexhill, Sussex, and on one of the crosses at Aycliffe, co. Durham,⁴ thus showing that there must have been a considerable amount of intercourse between the Cornish and Saxon Christians in pre-Norman times. The coped stone at Lanivet⁵ has a zoöomorphic termination in this respect resembling those in the north of England and Scotland. I can detect no Irish influence upon the art of the Cornish crosses.'

MISCELLANEOUS MONUMENTS

COPED STONES⁶

Up to the present only four coped stones have been found in Cornwall, viz. :—*Burian, St.*—In churchyard; *Lanivet*—In churchyard; *Phillack*—In churchyard; *Tudy St.*—In churchyard.

Those at *St. Burian* and *Phillack* are only portions of the stones; the former appears to consist of the middle third, and the latter of about half of its original length, showing one end.

The *Lanivet* stone, shown on Plate XVIII, is by far the best example. It is of the boat-shaped type. The top and sides are filled with key-patterns, and on what may be termed the hips of the stone are four animals resembling dogs, while on each end are two double beaded rings interlaced, and on each of the slopes above a triquetra knot. The key-patterns upon it are found in two other instances, at *Penally*, Pembrokeshire, where they both occur on the same panel of the cross-shaft, the lower portion of which contains the pattern found on the top of the *Lanivet* stone, and the upper portion bears that found on its sides, and also on the bronze sword-hilt of *Leofric* in the British Museum, dug up in 1883 under the foundation of a house in South Street, Exeter. Mr. Romilly Allen noticed this last instance, and embodied all three with illustrations in a short paper.⁷

The *St. Tudy* coped stone is similar in shape to that at *Lanivet*, but is wider at one end than the other. The sides are arcaded, and the top has on one side scroll-work, and on the other a four-cord plait ending in a twist. On the slope of the wider end is a triquetra knot, and on the ends wide head-work.

EARLY CROSS SLABS⁸

There are only five of these, viz. :—*Lanivet*—In churchyard; *Temple*—In churchyard (2); *Towednack*—In churchyard; *Wendron, St.*—In church; and all are different from each other.

¹ See Pl. XVI.

² See Pl. XVIII.

³ The two examples in Cornwall are on the sides of the *Lanherne* and *Sancreed No. 2* crosses, a third instance of the pattern being on the *Waterpit Down* cross-shaft (Pl. VI, No. 43), but the head is either omitted or has been broken off.

⁴ A somewhat similar design, but with two dragons, is carved on a sepulchral slab at *Barningham*, Yorkshire. See *Cutts, Sepulchral Slabs*, Pl. XXXV.

⁵ See Pl. XVIII.

⁶ *Old Cornish Crosses*, 411.

⁷ See *Reliquary and Illustrated Archaeologist*, vol. v (1899), 189.

⁸ *Old Cornish Crosses*, 419.

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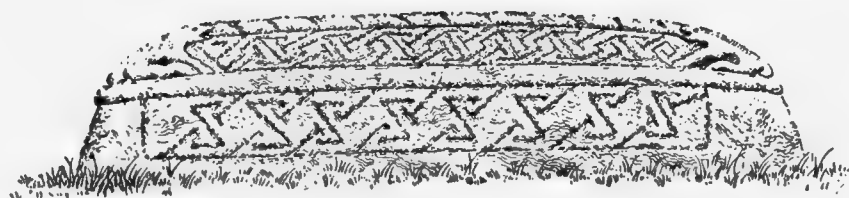
PLATE XVIII



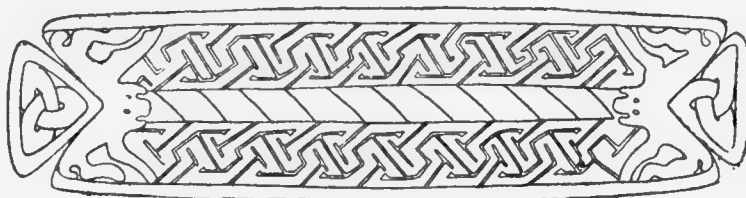
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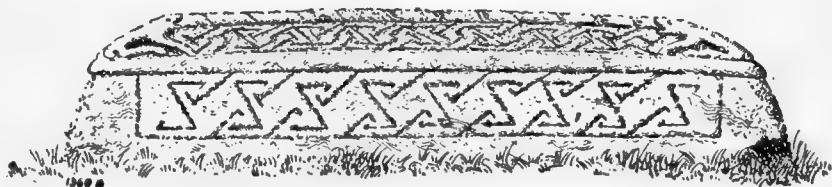
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A. S. Anglin
3 May 1889

Scale 0 1 2 3 4 5 6 7 8 9 10 Feet

EARLY CHRISTIAN MONUMENTS

The opportunity must here be taken of publicly protesting against the disgraceful manner in which the monuments have been neglected, mutilated, broken, and even destroyed, as can be proved by a glance at my 'List of purposes for which some of the Cornish Crosses, etc., have been re-used.'¹ This list occupies three pages, and contains about ninety instances. Dozens have been used as gateposts, though only some fifteen of the most striking examples are given under this head, eight cases of which will be found amongst the inscribed stones. Some few have been rescued, but a great many more yet remain in use.

It is impossible to comment too forcibly on this subject, especially as the partial destruction of our monuments is by no means a thing of the past, for only recently² we had to complain of the mutilation of a small and unique cross in Cardinham churchyard,³ because the sides of its shaft had been hacked off to make it fit the top of an ancient inscribed stone,⁴ on which it was stuck.

The amount of ignorance, apathy, and indifference displayed by those who should be most concerned in preserving, instead of mutilating, is appalling; few seem to care, and none trouble to interfere.

There is an extraordinary practice now prevalent in Cornwall of sticking cross-heads on the tops of new and very tall granite shafts. We submit that this is *not* restoration, and consider that the parish churches are the proper places in which to preserve these fragments, a precaution which was taken in the case of the second Ogam inscribed stone found at Lewannick. Or if the cross is fairly complete with head and shaft, and its original site is unknown, let it be erected in the churchyard on a rough boulder as a base. The taller of the two crosses discovered at Crane, near Camborne, in 1896, was aptly fixed in a base which happened to be in the churchyard.

Perhaps the worst case of this so-called restoration is that of the fine cross-head at Carminnow, near Bodmin. It has been 'skied' on top of a huge granite shaft, too high even to allow of a proper examination of the ornament, and by way of making the *restoration* more ridiculous, it has been mounted on a base of two steps, exactly like those used for the late Gothic crosses.

A few public-spirited persons, at their own expense, have done something in the way of restoration, properly speaking, and among the monuments thus rescued the following may be mentioned:—

The second inscribed stone found at Lewannick.

The fine ornamented cross-shaft at Par, formerly at Biscovey.

The two ornamented crosses in Sancreed churchyard.

The Waterpit Down ornamented cross-shaft.

The tall wheel cross at No-Man's-Land,⁵ Lanlivery, which had been cut in two and re-used as steps in a stile, was taken up in September, 1900, by Mr. Richard Foster, properly dowelled together, and fixed in a rough moorland granite base, in a well selected position, close to where it was found.

But the most remarkable instance of the restoration of a cross is that in St. Teath new churchyard, effected by the Revd. F. Worthington, while curate in charge, about 1883. The cross had been deliberately broken up, but after a careful search five pieces of the shaft and most of the head were found. All were matched, and the whole, with bolts and cement, was once more erected.

It is much to be deplored that such a praiseworthy example is not more often followed, especially since the expense attached is not very considerable, and there is plenty of this good work to be done.

The importance of insisting on the necessity of protecting ornate monuments from the weather cannot be too strongly urged, as from experience we have found that by simply rubbing the hand over the surface of such a stone the small particles of which the granite is formed can be heard falling on the base. This is due to what is known as 'bruising,' which means that every blow necessary for cutting the ornament bruises the face of the stone, and thus loosens the particles, and the weather does the rest. So destructive does this become in time, that in pulling out a small piece of the tough lichen that grows on the crosses, a little root, so to speak, of granite comes away with it. As with the perishable nature of the

¹ *Old Cornish Crosses*, 22.

² *Reliquary and Illustrated Archaeologist*, viii (1902), 50.

³ *Old Cornish Crosses*, 173.

⁴ Pl. I, fig. 4.

⁵ *Reliquary and Illustrated Archaeologist*, vii (1901), 130.

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ornament, so it is with the inscriptions, for Borlase tells us what the inscription was on the Indian Queens stone, but now only a very few letters are legible.

It is most desirable that proper archaeological maps should be prepared on a large scale, with all the monuments marked thereon. These should then be carefully registered, and included under the 'Act for the Preservation of Ancient Monuments.' Till some such steps are taken, there will be no obstacle to the constant and deplorable shifting about¹ of these ancient memorials, or still worse, to the spectacle of their use for alien purposes, or perhaps even to a similar case of mutilation to that at Cardinham just described.

Mr. J. Romilly Allen's remarks on this subject are much to the point² :—

'It may be worth while remarking that no other nation possesses such a wonderful series of monuments, illustrating the history of Christian art at one of its most obscure periods, and probably no other nation would have treated them with such scorn, or allowed them to be so ruthlessly destroyed. Many of these priceless treasures have been lost altogether, others have been damaged by persons ignorant of their real value, and the whole are perishing miserably from exposure to the weather. Casts, or at least photographs should be taken before every trace of the sculpture has disappeared. This is the more important, as many fragments which have been preserved for centuries by being built into the walls of churches are being brought to light from time to time in the course of modern restorations and alterations, and these are now also in many cases exposed to the weather. A gallery of casts of Celtic sculptured stones would be invaluable for purposes of archaeological research, and might be the means of reviving the national taste for the art of sculpture, in which our own countrymen at one time attained so high a standard of excellence.'

SCULPTURED NORMAN TYMPANA

There are eleven examples in the county, one of which, at Tremaine, has unfortunately been entirely defaced. They fall into two classes, namely, those with figure sculpture, and those with other ornament. In the first class an Agnus Dei occurs at Egloskerry, No. 1, St. Michael Caerhays, Perranarworthal, and St. Thomas by Launceston; a dragon at Egloskerry, No. 2, and Tremaine (defaced); and a tree between two beasts at Treneglos.

Only six retain their original doorways, viz., Cury, Egloskerry, No. 2, St. Michael Caerhays, Mylor (both), and Tremaine. The remainder of the tympana, except in one case, have been found in the walls of their respective churches during re-building.

With regard to the method of executing the sculpture, it may be briefly stated, that as a rule, it is in rather shallow relief, the general effect being produced by sinking the back ground surrounding the subject, but not to any great depth, a characteristic which is most noticeable in those at Egloskerry and Treneglos.

Egloskerry, No. 1.—This stone, Plate XIX, fig. 1, was discovered during alterations to the church in 1887. It had been used as building material in the wall of the south aisle, and is now built into the inside wall of the church immediately over the south doorway. It is made of a sandstone not known in the neighbourhood, and measures 3 feet 11 inches long and 1 foot 11½ inches high. Within a curiously shaped recess having a moulded border is an

¹ By 'shifting about' is meant being taken up and used, e.g., by private persons as tombstones to someone or other, an object for which they were certainly never intended. One gentleman is blessed with two on the large stone that covers his grave.

² *Early Christian Symbolism*, 82.

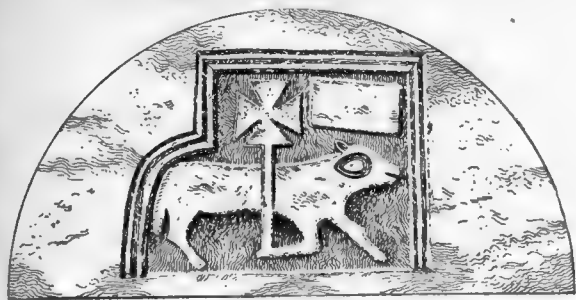


FIG. 1.

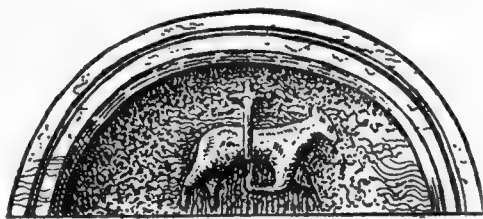


FIG. 2.



FIG. 11.



FIG. 3.

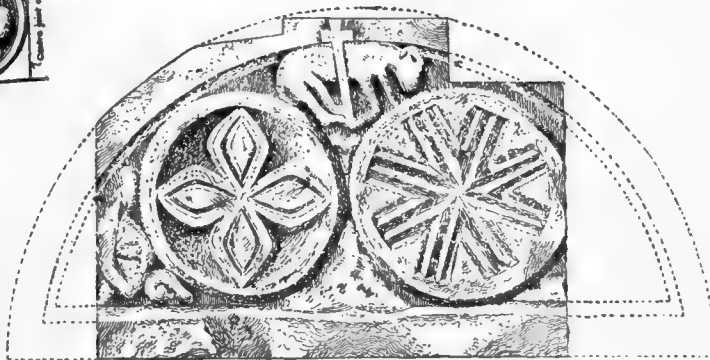


FIG. 4.

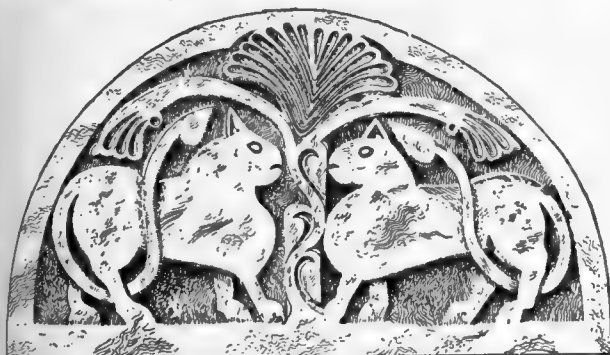


FIG. 5.



FIG. 6.

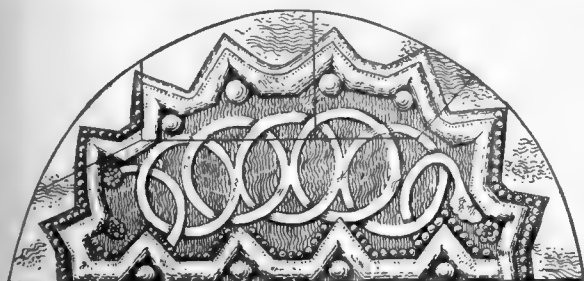


FIG. 7

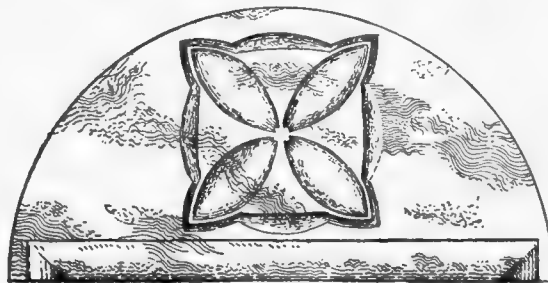


FIG. 9.

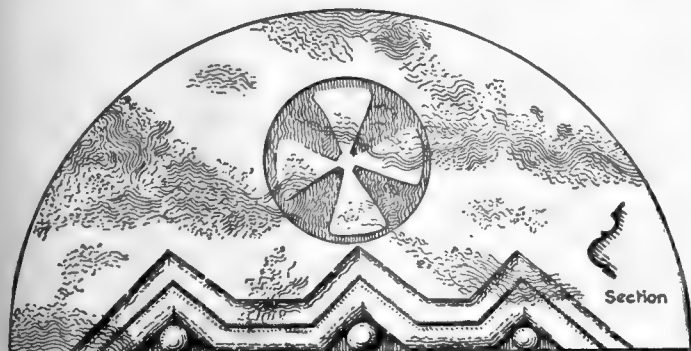


FIG. 8.

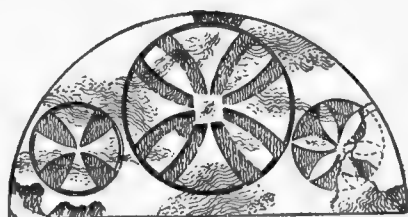


FIG. 10.

Scale, $\frac{1}{18}$ actual size.

SCULPTURED NORMAN TYMPANA IN CORNWALL.

Fig. 1. Egloskerry, No. 1—Fig. 2. St. Michael Caerhays—Fig. 3. Perran Arworthal—Fig. 4. St. Thomas-by-Launceston—Fig. 5. Treneagos—Fig. 6. Egloskerry, No. 2—Fig. 7. Cury—Fig. 8. Mylor, No. 1—Fig. 9. Mylor, No. 2—Fig. 10. Rame—Fig. 11. St. Anthony-in-Roseland ($\frac{1}{2}$ actual size).

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Agnus Dei, one of whose legs is missing. Above the head is a rectangular object, cut rather on the slope, and probably intended for a book.

St. Michael, Caerhays.—In shape the tympanum is elliptical, Plate XIX, fig. 2, the curved portion having a quaintly moulded border projecting about a couple of inches beyond the recessed face within; including the border it is 3 feet 4 inches wide and 1 foot 5 inches high. On the recessed face is an Agnus Dei; this subject on a north doorway is of very rare occurrence.

Perranarworthal.—This tympanum, Plate XIX, fig. 3, was discovered during the renovation of the church in 1884–5, and is now built into the wall over the south doorway. It is 3 feet wide and 1 foot 5 inches high. The subject is an Agnus Dei, in a border formed by an undulating stem, the spandrels being filled with late Romanesque leaf-work, very similar to the enriched band on the lower portion of the font bowl in the church of St. Stephen¹ by Launceston.

St. Thomas, Launceston.—Built in the wall of the south porch of the church, east of the doorway, immediately above the plinth, is the greater part of a tympanum, Plate XIX, fig. 4, having an average thickness of 8 inches. It had evidently been cut up to fill the space it now occupies, extending from the moulded jamb of the doorway to the south-east angle of the porch, being further mutilated at the top to form a better joint with the adjacent stones. The original dimensions would have been 5 feet wide by 2 feet 6 inches high, and it was therefore the largest in Cornwall, exceeding that at Mylor, No. 1, by 3 inches.

Within a moulded border are two large circles, that on the left containing a curiously shaped equal-armed cross, and that on the right a wheel-like design, consisting of eight radiating bars of equal width, square at their ends, and mitred at the centre. Above the circles is an Agnus Dei in a somewhat contorted position.

To what building this stone originally belonged is not known, while a like mystery is attached to the beautiful twelfth-century doorway which now forms the principal entrance to the White Hart Hotel in Launceston. The doorway and tympanum are of the same material, from the once famous quarry at Hurdwick, near Tavistock, but there may be no further connexion between the two.

In addition to the four instances of the Agnus Dei already described there is one other contemporary example (fig. 11) on the inner order of the Norman south doorway of the church of St. Anthony in Roseland, near Falmouth.

In this example the roseline method of indicating the wool by means of incised zig-zag lines should be noticed, and the incised cross cut at the intersection of the arms of that borne by the Lamb.

Treneglos.—This (Plate XIX, fig. 5) is now built into the south wall of the church, directly over the label of the doorway. The material from which it is made is a bad piece of 'ventergan,' a kind of local green slate, and the stone being face-bedded is flaking badly. It is 4 feet 3 inches wide, 2 feet 5 inches high.

The subject illustrated is composed of a central tree having an undulating trunk with three leaves in the spaces thus formed, from the top of which spring two curved branches right and left having foliated terminations, while on the top is a fan-shaped piece of foliage. It is probably intended to represent 'The Tree of Life,' so often found in this style of work. Beneath are two beasts, one on either side of the trunk, placed symmetrically and facing each other, their tails bent round between the hind legs, carried upwards to the top of the heads, and finished with a leaf-shaped end.

Egloskerry, No. 2.—The doorway of which this tympanum, Plate XIX, fig. 6, forms a part is situated on the north side of the church, and although now built up is intact both inside and outside. It is 3 feet 1½ inches wide, and 1 foot 8 inches high at the apex, and is made of the same stone as the other in this church. The subject is a dragon.

Tremaine.—On the north side of the church is a doorway; formerly built up, but reopened in 1903. It is made of one of those numerous varieties of green slate which abound in this part of the county, and has a tympanum 3 feet 6 inches wide, and 1 foot 8½ inches high.

Amongst the writers who mention the existence of sculpture on this stone is Polsue,² who says in his remarks on this church, 'a blocked north doorway has a tympanum . . . on which is rudely carved a dragon,' but the whole of it has been ruthlessly hacked off, probably at the time when the circular hole was cut through the stone for the passage of a flue pipe.

¹ Illustrated in *Arch. Camb.* 5th Ser. xiii, 348.

² *A Complete Parochial History of the County of Cornwall*, vol. iv (1872).

EARLY CHRISTIAN MONUMENTS

The only vestige of carving now remaining is a small loop near the top of the hole, which might perhaps be a bit of the dragon's tail.

Cury.—This tympanum (Plate XIX, fig. 7) is over the south doorway of Cury church. The greenish-coloured stone of which it is made does not appear to have been procurable in large blocks, and it is made up of four separate stones, the peculiar jointing of which is shown on the drawing. It is 4 feet long, and 1 foot 10½ inches high. It has a border of chevron moulding within which is a design of five interlacing rings,¹ having a portion of one passing over and under the ring at each end, and terminated at the top on the right side by a rosette, and on the left by a drooping leaf, while in each of the lower corners is a rosette.

Mylor.—Like Egloskerry, the church at Mylor possesses two tympana, but in addition retains both its doorways,² one (No. 1) forming the northern, and the other (No. 2) the western entrance to the building; the former being the larger and finer of the two, while the latter appears to have suffered somewhat by restoration, and a good deal of it is new.

No. 1, Plate XIX, fig. 8, measures 4 feet 9 inches wide, and 2 feet 4½ inches high, and is carved with a plain cross, in low relief, in a circle; it has widely expanded limbs and a pronounced inclination to the right. The little quadrants at the intersection of the limbs occur on both the Mylor tympana, and are also found on four of the Cornish crosses,³ viz., St. Agnes, St. Kew, Roche, and Lesnewth.

A line of chevrons with three little bosses in the interior angles runs nearly across the bottom of the stone, and is a continuation of the same moulding on the jambs.

No. 2 is 3 feet 9½ inches wide, and 1 foot 10¾ inches high. The subject is a cross of an elaborate nature, Plate XIX, fig. 9. The bead running along the springing line is a continuation of that on the jambs below, which is thus carried completely round the opening.

Rame.—This tympanum is now built into the west wall of the south aisle of the church. It was found in this aisle in 1884, and having been used as a building stone is somewhat mutilated. It is made of a similar kind of stone to that at Cury, and measures only 2 feet 9½ inches long, by 1 foot 4¾ inches high.

The ornament upon it is contained in three circles, a large one in the centre, and a much smaller one on either side; the bottom of the circles being on a level. In the largest circle is a kind of double cross, Plate XIX, fig. 10. The smaller circle on the right contains a cross like that on tympanum No. 1 at Mylor, while that on the left is occupied by what seems to have been a six-pointed star, the missing portions of which are suggested by the dotted lines. A star of this kind is found on most of the sides of a particular type of font, of which there are nine examples in Cornwall, namely, Altarnun, Callington, Jacobstow, Landrake, Laneast,⁴ Lawhitton, Lezant, St. Thomas the Apostle,⁵ and Warbstow.⁶

In conclusion it only remains to add that the illustrations of the tympana, like those of the inscribed stones, the ornamented crosses, and coped stones, have been with four exceptions prepared from the writer's own rubbings, photographed to scale so as to ensure accuracy.

¹ A band of plain interlaced rings similar to these extends across the bottom of a tympanum at Beckford, Glouc. See J. R. Allen, *Early Christian Symbolism*, 261. An ornate fragment of Norman sculpture with interlaced rings, preserved in the Chapter House at Westminster Abbey, is engraved by Parker in his *A.B.C. of Gothic Architecture*, 3rd ed. 1882, 79.

² Excellent photo illustrations will be found in the *Journ. Royal Inst. Cornwall*, xiv (1901), 394.

³ Langdon, *Old Cornish Crosses*, 76 to 79, and 165.

⁴ Illustrated in *Arch. Camb.*, Ser. 5, vol. xiii, 159.

⁵ *Ibid.* 347.

⁶ *Ibid.* 160.

MAP

showing

CAMPS AND EARTHWORKS

of

CORNWALL.

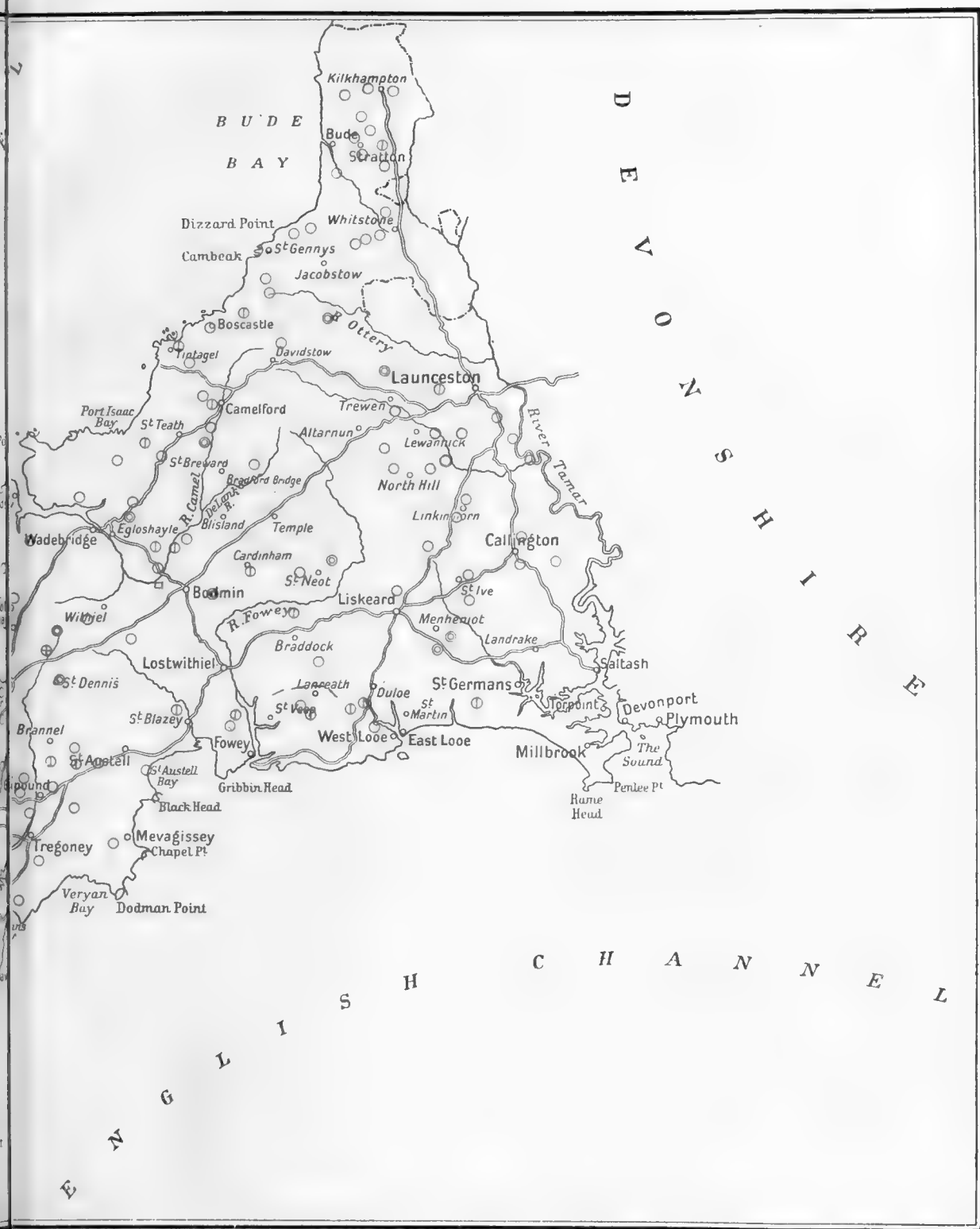
Scale of Miles.



Reference

- List I. Cliff Castles.
- ⊙ " II. Hill Castles.
- ⊖ " III. Div. I. Double Enclosures.
- " II. Single Enclosures.
- " " Roman
- " IV other Works
- ⊕ " V Plane-an-Gwariow





ANCIENT EARTHWORKS AND DEFENSIVE ENCLOSURES

IN this chapter, which will be found to contain a fairly complete list of the ancient earthworks of the county, an attempt is made to classify them according to their physical characteristics. This plan has been adopted partly because no other method is at present equally available, and partly because the distinctions upon which the arrangement is based are well marked. With the exception of the work done at Chyoon Castle by the Penzance Natural History and Antiquarian Society in 1895 and at Tregeare in St. Kew by Messrs. Burnard and Baring-Gould in 1902, nothing in the nature of organized excavation has been attempted, and in the absence of the information which may be derived from such a source, or from historical record, this classification cannot at present be regarded as final, but the differences in the typical features which lead to it are obvious, and encourage the assumption that they have a historical foundation.

This method of classification has also the advantage that it agrees with the scheme for recording such works prepared by the committee appointed for that purpose by the Congress of Archaeological Societies and published in 1903, with an appendix in 1905.

The first list (Class A) contains defensive works which are 'partly inaccessible by reason of precipices, cliffs or water.' In each case in Cornwall there is a rocky headland, connected to the main by a narrow neck of land across which run often two and sometimes three lines of entrenchment. On the sea side they are practically inaccessible. With the exception of Little Dinas in St. Anthony in Meneage, which perhaps may yet prove to be of a different origin from the others, it would be impossible to land except on a very few summer days, while on the land side they are completely overlooked. King Arthur's Castle at Tintagel is, as far as the situation is considered, a grand specimen of the class; but although there may perhaps have been mere defensive entrenchments there at one time, they have long since been strengthened by the mason-built walls, which give it quite another character, and in consequence it is not included as a cliff castle coming within the limit of this chapter.¹

The second list, which corresponds with the Class B in the scheme of the committee, contains the hill castles. These are earthen or rough

¹ See *Maclean*, iii. 194, etc. for plans, etc.

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stone entrenchments which occupy the tops of prominent hills. They are roughly circular following the shape of the hill, large in diameter and having generally two and in some cases three lines of entrenchments. In many the walls are still of considerable height. Dr. Borlase wrote in 1769 of Chyoone Castle in Morvah : 'By the ruins of these walls I judge that the outermost could not be less than 10 feet high, and the innermost about 15, but rather more.'¹

As a class these hill castles stand, plain to be seen, on the summits of steep hills. Conspicuous for miles, they were surely the work of confident men who wished to command the country and had no fear of being seen. Castle an Dinas in St. Columb lords it haughtily over 100 miles of land and sea, and Chyoone Castle in the west, only second, tops the hill crest like a crown.

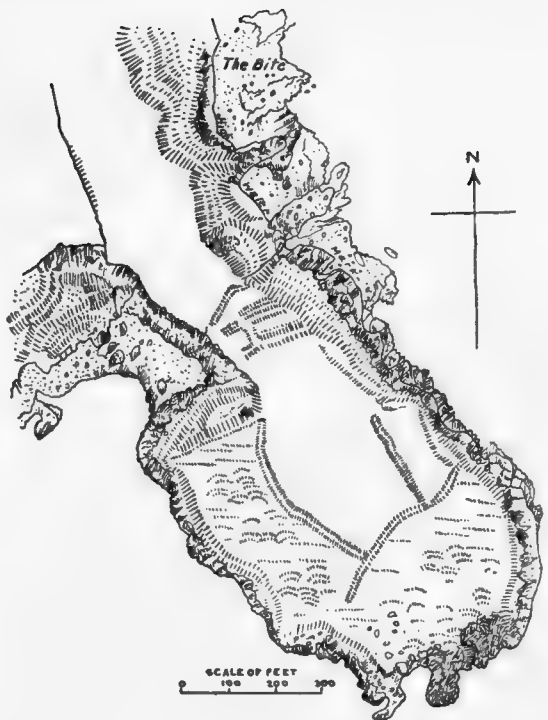
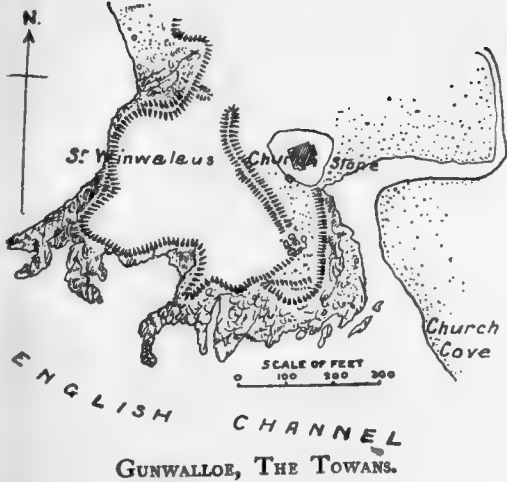
Of the total number of this class given in the appendix, it is noteworthy that nine are west of Redruth, and of these seven are in the small district in the extreme western end of the county beyond Hayle estuary, while there are none on the tops of the greater hills on the Bodmin moors.

The works put in the third list are very different. They are as a rule single banks of earth enclosing spaces of which some are round, some square with rounded corners, and some oblong, both round and square-sided. They stand on low ground, and in most cases where the land slopes to a river or stream. Hidden in sheltered places and now in many cases ploughed down so that only a low mound or terrace marks the site, they are not easy to find. Mr. S. R. Pattison observed² of Upton Castle in Lewannick that it was commanded on all sides, and this is true of all these entrenchments which are in the neighbourhood of the hills. Near Upton, in the parishes of North Hill, Lezant, and Linkinhorne, there are many, and all, even within the limits of human eyesight, may be said to be at the mercy of any man who would hide himself under a furze bush on the Caradon Hills. From this it would seem to follow that to the men who threw up these earthworks the hills with their castles were a matter of no moment, and they sought to protect themselves against quite other dangers.

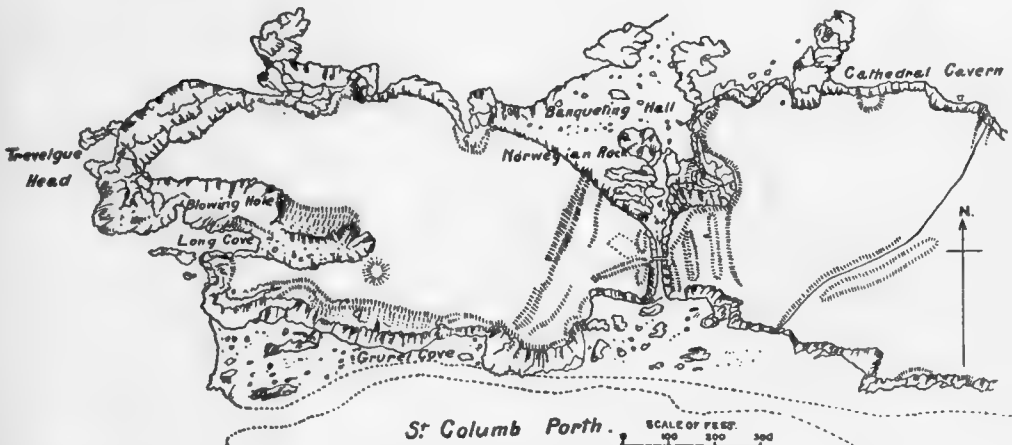
They have been divided into two divisions, distinguishing those which have more than one bank or line, or which have outworks or the appearance of an outer court, and though subsequent research may show that this is not a real ground for making a distinction, yet in the present state of knowledge it seems worth making. It might have been possible to divide this class further into round and square-sided, but some of them are very irregular, and some might be considered as either, while the other features by which they have been classed are more uniform. Some such subdivision may yet be established. Beyond this classification they do not lend themselves readily to fit the headings suggested in the report of the committee.

¹ *Antiquities of Cornwall*, p. 347.

² *Journ. Roy. Inst. Cornw.* (1871), vol. iv. pt. xiii. p. 73.



ST. AUSTELL, BLACKHEAD.



ST. COLUMB MINOR, TREVELGUE.



ST. JUST IN PENWITH, KENIDJACK CASTLE.



ST. KEVERNE, ARROWAN.

CLIFF CASTLES, LIST I.

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In 1848 Mr. McLauchlan¹ mentions 'a valuable suggestion by Mr. J. D. Crook respecting the number of these camps surrounding the heads of the two estuaries of the Fal, at Grampound and Truro.'²

The number on the shores and in the immediate neighbourhood of the Helford and its creeks is also noticeable.³

There is also the peculiar feature here that on the north side of the main estuary the five camps, Carwythennack, Nancenoy and Merthen in Constantine, Grumbla in Wendron and the camp south of Gweek in Mawgan, are high up on the slopes, and overlook the tidal waters or valleys which were possibly tidal when the camps were made; while on the south all the camps, except the one at Tremaine in St. Martin, are placed well away from and out of sight of the creeks. And it is also noteworthy that to the north of the Helford, from Penryn to Helston, the district of about 10 miles by 4, including the parishes of Mabe, Stithians, Constantine and Wendron, is the largest area of land in Cornwall, throughout which no camps of any kind are found except the four on the shores already mentioned. But south of the estuary in the Lizard district there are not less than twenty. It may be that these camps will yet tell us something of the days when the Channel swarmed with the war-galleys of the Northmen.⁴

Two of the 'camps' in List III., both nearly exact squares with rounded corners, namely 'Tregear' at Nanstallon, in Bodmin, and Bosence in St. Erth are, from the character of the objects found in them, usually accepted as Roman, and they have therefore been placed in a subdivision under this description.

A division of these earthworks in the manner here attempted has been made by previous writers. Dr. Borlase⁵ arranged them in two classes, describing the hill and cliff castles as Danish and the others as Roman. In this scheme the cliff castles are the places at which the invaders made good their landing, and the hill castles are their subsequent holds on the country. In attributing to the hill castles a Danish origin he was supporting the theory which prevailed in his day and, as Leland knew nothing of it, perhaps originated with R. Carew,⁶ who wrote in 1602 of the hill castles 'which are termed Castellan Denis or Danis as rayased by the Danes when they were destyned to become our scourge.'

Dr. Borlase mentions only six of the entrenchments, including in these Little Dinas in St. Anthony, and there can be little doubt but that he was greatly influenced to call these Roman by the finds then recently (1756) made at Bosence in St. Erth, and by the 24 gallons 'of Roman brass money of the age of Constantine' found in 1735 at Condurrah near Little Dinas.

¹ *Roy. Inst. Cornw.* 30th Rep. (1848), p. 25.

² See Probus, Kenwyn, St. Clement, in List III. Div. ii.

³ See Constantine, Manaccan, St. Anthony, St. Martin, and Mawgan in Meneage.

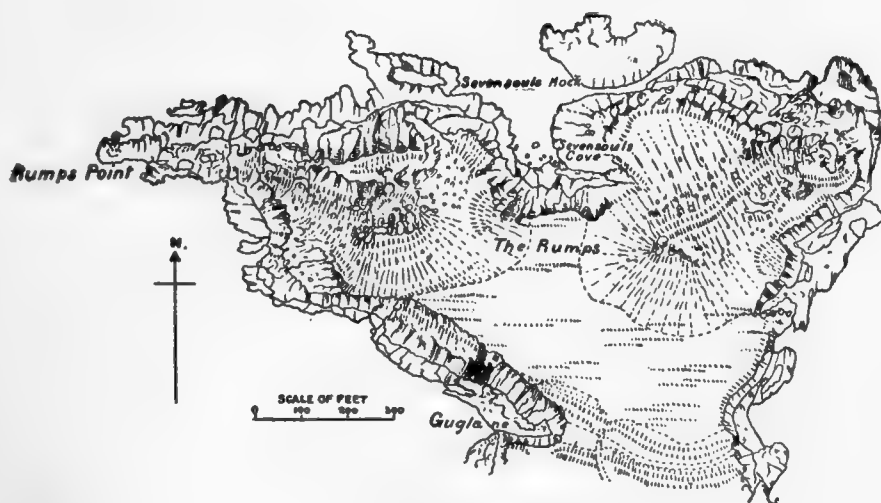
⁴ *Pol.* bk. ii. ch. i.

⁵ Borlase, *The Antiquities of Cornwall* (1769), pp. 34-8.

⁶ Carew, *Survey of Cornwall* (1602).



ST. LEVAN, TRERYN DINAS.



ST. MINVER, PENTIRE.

CLIFF CASTLES, LIST I.

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The next writer who dealt with this subject, the Rev. R. Polwhele,¹ agrees with Dr. Borlase in calling the entrenchments Roman, and goes further. He was apparently acquainted with a larger number of them, and he writes confidently 'almost all of our camps are Roman.'

On the other hand he entirely refuses to accept a Danish origin for the hill and the cliff castles which he puts together (including amongst them, quite unaccountably, Carnabargus in St. Erth) and calls them Irish.

Since these two writers little has been done towards a systematic investigation of these camps and earthworks until recent years. In 1881 Mr. T. Cornish wrote a paper² in which, beginning at Hayle, and being guided largely by the syllable *car*, *gar* or *gear* as meaning 'camp' in the place names, he built up a suggestion of military operations extending from Phillack to Helston, in which the Cornish folk defended themselves against a Saxon invasion from the estuary on the north coast; and suggested here the identification of the three battles in which, according to the Chroniclers,³ the Cornish with the help of Ivor, king of Brittany, recovered their land from the Saxon in the year 755 A.D.

In 1890 the Rev. W. Iago,⁴ starting with the objects of Roman origin found at the 'Tregear' camp at Nanstallon in Bodmin, and guided largely by the distinction between square camps and round, constructed a Roman invasion from Port Isaac opposed by the Cornish. Yet another explanation, and perhaps the most fruitful of all, has been put forward quite recently. In 1871 Mr. Pattison⁵ expressed an opinion that Upton Castle in Lewannick was made to protect 'the possessions of a group of villagers in their huts.' But it is to Mr. O. B. Peter⁶ that we owe the broad idea that all these entrenchments are fortified villages, appropriate to a time when men needed rather to protect their herds and property, especially at night, from a surrounding of lawlessness and disorder than from any actual military operations. In addition to the features of these 'village entrenchments' described by Mr. Peter, it may well be noted that the greatest number of them are found in the districts on the north and the east side of the Bodmin moors. In these same parts, and especially between the moors and the Tamar, Saxon and Cornish place names are freely intermixed, and many of the Saxon names end in 'stow' or 'stock.' Our chroniclers relate⁷ that although the Cornish were driven out of Devonshire about the year 735 A.D. the warfare did not end until Athelstan fixed the Tamar as the boundary between the two races in 936. These entrenchments, 'stockades,' are imprints which two centuries of border warfare might well leave on the face of the country.

There is also a large number near together in the parishes north of Truro, in Newlyn, St. Allen, Perranzabuloe and St. Enoder; and here

¹ *History of Cornwall* (1803), pt. i. ch. iv. p. 73.

² *Trans. Penz. Nat. Hist. & Antiq. Soc.* vol. i. (new ser.) (1882), p. 126.

³ Borlase, *Antiquities*, 410.

⁵ *Journ. Roy. Inst. Cornw.* (1871), vol. iv. p. 73.

⁴ *Journ. Roy. Inst. Cornw.* (1890), vol. x. p. 229.

⁶ *Ibid.* (1902), vol. xv. p. 107.

⁷ Borlase, *Antiquities*, 410.

ANCIENT EARTHWORKS

too are traces of Saxon in the names of Newlyn, Crantock and Tre-sausen.¹ Both these districts are comparatively low ground, in fact St. Enoder is said to be the most level part of Cornwall, and both have been long under cultivation.

Mr. Peter includes as 'village entrenchments' Tregeare in Eglo-skerry, Warbstow burrows, Helsbury Beacon in Michaelstow, and Kelly Rounds in Egloshayle, all of which have, in the Appendix to this chapter, been placed among the hill castles as being more of that character.

There are in Cornwall three mediæval castles which stand on the summits of small partly artificial hills, viz. Launceston, Trematon and Restormel. There may very possibly have been more primitive defences on these hills originally, but there is now no trace, and the existence of the more modern buildings do not allow them to be included in this chapter.

The two remaining classes into which the earthworks of Cornwall are divided in the Appendix are Class IV., the long banks or dykes which do not enclose a space, and Class V., the Plain-an-Gwariow. The name, which is still in use in St. Just in Penwith, is applied to circular enclosures or amphitheatres in which sports were held and the miracle plays are said to have been acted. Gwennap Pit is included, but it is possibly caused naturally by the running together of old mine workings. Carew in his *Survey of Cornwall* in 1602 (p. 71) speaks of earthworks of this class as though they were thrown up temporarily when and where required, and Dr. Borlase² says, 'We have great numbers of them.' He however mentions only two, St. Just (*Antiq.* 208) and Perran (*Nat. Hist.* 298), both of which are still in fair preservation. The two at Newlyn East and Indian Queens (each of which is known locally as 'the Pit') were made about 60 years ago for religious meetings. They are still used for this purpose and are carefully kept in good order. Although not ancient they are included because they preserve the pattern of the older works from which they were undoubtedly copied. Those at Ruan Major, Ruan Minor and Landewednack have disappeared, while at Redruth little or nothing remains but the name at the north end of the town.

EXPLANATION OF AUTHORITIES REFERRED TO

Arch. Camb. = *Archæologia Cambriensis* (1863)

Blight List = *List of the Antiquities of Penwith and Kirrier*, by J. T. Blight (1862)

Bond = *Typographical and Historical Sketches of the Boroughs of East and West Looe*, by Thomas Bond (1823)

Borlase = *The Antiquities of Cornwall*, by W. Borlase, LL.D., F.R.S. (1769)

Borlase Nat. Hist. = *The Natural History of Cornwall*, by W. Borlase, LL.D., F.R.S. (1758)

Buller = *Statistical Account of the Parish of St. Just in Penwith*, by Rev. John Buller, LL.B. (1842)

C.A.A. = *The Report of the Cambrian Archæological Association* (Visit to Cornwall) (1862)

Carew = *The Survey of Cornwall*, by R. Carew (1602)

¹ Tre = 'a dwelling,' Sausen = 'Saxon.'

² *Antiquities*, 207.

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- Couch* = *The History of Polperro*, by Jonathan Couch, F.L.S. (1871)
Daniel = *A Geography of Cornwall*, by Rev. J. J. Daniel (1854)
Drew = *A History of Cornwall*, by Fortescue Hitchens, published by Samuel Drew (1824), 2 vols.
Edmonds = *The Land's End District*, by Richard Edmonds (1862)
Gilbert = *The Parochial History of Cornwall*, by Davies Gilbert, F.R.S. (1838)
Hals = *Parochial History of Cornwall* (circa 1700), published in Gilbert, q.v.
Leland = *Itinerary of Cornwall*, by John Leland (1533-40); Hearne's (1710) edition, published in Gilbert, q.v.
Lysons = *Magna Britannia*, by Rev. D. Lysons and S. Lysons, vol. iii. Cornwall (1814)
Maclean = *The History of Trigg Minor*, by Sir John Maclean, F.S.A., 3 vols. (1873)
Næn. Corn. = *Nænia Cornubiæ*, by W. Copeland Borlase, F.S.A. (1872)
Paris = *A Guide to Mount Veal*, by Ayrton Paris (1814)
P.N.H. & A.S. = *Transactions of the Penzance Natural History and Antiquarian Society*
Pol. = *The History of Cornwall*, by Rev. R. Polwhele (1803-6). The references are to bk. i. ch. iv. unless stated
Rashleigh = *Notes on the Pit of the Giant alias St. Sampson's*, by E. W. Rashleigh (1885)
R.I.C. = *The Reports of the Royal Institution of Cornwall*. Truro, half-yearly. Mr. H. McLauchlan's are in the Reports 1846-52 inclusive.
R.G.S.C. = *Transactions of the Royal Geological Society of Cornwall*, Penzance
Thomas. Those mentioned in this reference only are included on the authority of some maps 'showing the Cornish of ancient forts, barrows, etc.,' drawn by Mr. R. Thomas of Perranarworthal in 1842, and now in the Museum of the Penzance Antiquarian Society
Tonkin = *Parochial History of Cornwall* (circa 1720), published in Gilbert, q.v.
Whitaker = *Notes on Tonkin*, published in Gilbert, q.v.
W. of Worcester = *The Itinerary of William of Worcester* (1478), published in Gilbert, q.v.

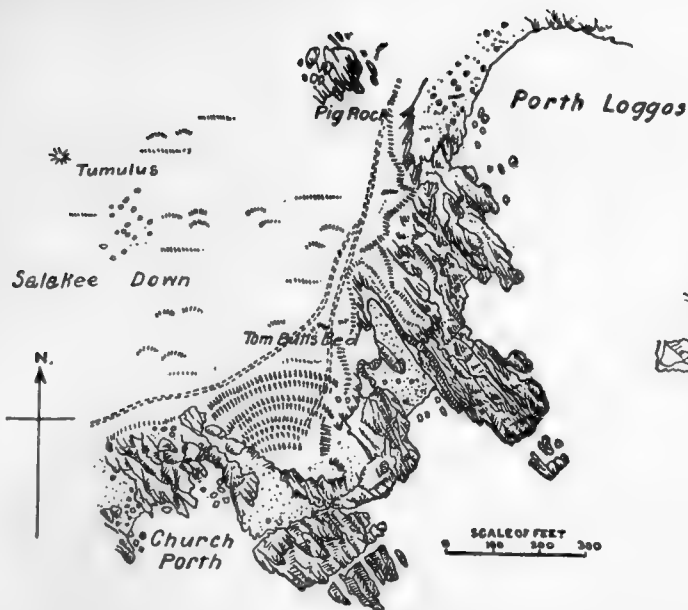
All the earthworks mentioned in the following lists are marked in the 1-inch ordnance survey, except where otherwise stated.

LIST I

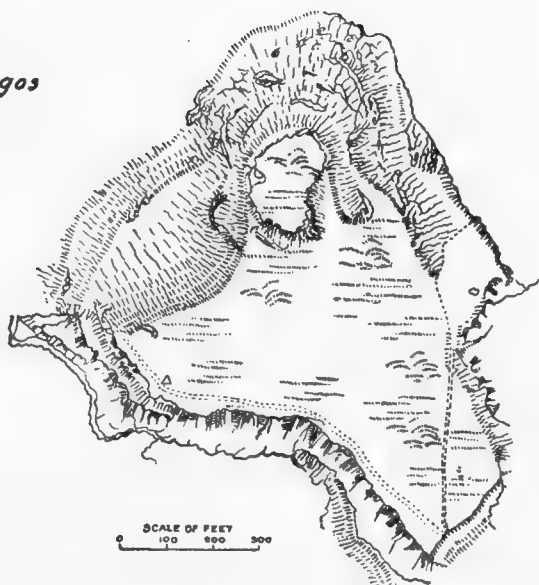
CLIFF CASTLES

- CUBERT.**—At Kelsey Head [*R.I.C.* 31st Rep. (1849), p. 36, O.S. xxxix. 5]
GUNWALOE.—Above the church [*Drew*, ii. 302, O.S. lxxx. 10]
ILLOGAN.—Near Tehidy [*Borlase*, 344; *Polwhele*, 111; *Lysons*, ccxlvii., O.S. lxii. 4 and lv. 16, one plan]
MAWGAN IN PYDER.—At Griffin's Point [*R.I.C.* 31st Rep. (1849), p. 36, O.S. xxxii. 5]
PADSTOW.—At Stepper Point [O.S. xviii. 11]
PERRANZABULOE.—At Penhale Point [*Thomas*]
ST. ANTHONY IN MENEAGE.—'Little Dinas.' The entrenchment and the headland enclosed by it are larger than is the case with the cliff castles generally. Tonkin (about 1730) says that Little Dinas was 'formerly fortified and had some guns placed on it to secure the entrance of Hailford Harbour.' It was held for the king in the Civil War and surrendered about 1646 [*Hals*; *Tonkin*; *Borlase*, 312; *Polwhele*, 121; *Lysons*, ccxlvii.; *Drew*, ii. 31; *Daniel*, 199; *R.I.C.* 30th Rep. (1848), p. 33 and plan]
ST. AUSTELL.—Black Head [O.S. lx. 1]
ST. COLUMB MINOR. At Trevelgue [*R.I.C.* 31st Rep. (1849), p. 36; *Næn. Corn.* 201 O.S. xxxi. 16]
ST. EVAL.—'Redcliff Castle,' Bedruthan [*R.I.C.* 31st Rep. (1849), p. 36; *R.I.C.* (1865) i. 64, O.S. xxiv. 13]
ST. GENNYS.—At Pencarrow Point [O.S. viii. 5]
ST. GORAN.—At Pabyer Point

The Dodman. Leland wrote, 'About a myle west of Penare is a forte near the shore in the paroch of St. Gerons. It is single-dykyd and within a but shot of the north side of the sayme apperith an hole of a vault broken up by a plough yn tylling. This vault had an issue from the Castelle to the se.' This description was identified by

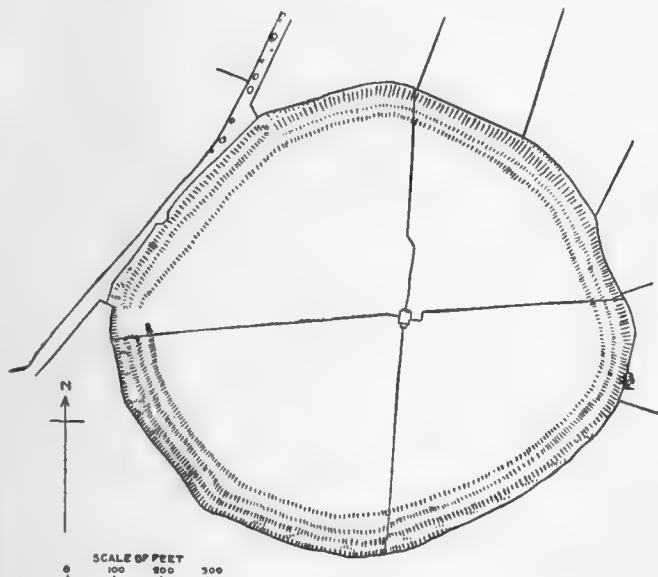


SCILLY, THE GIANT'S CASTLE.

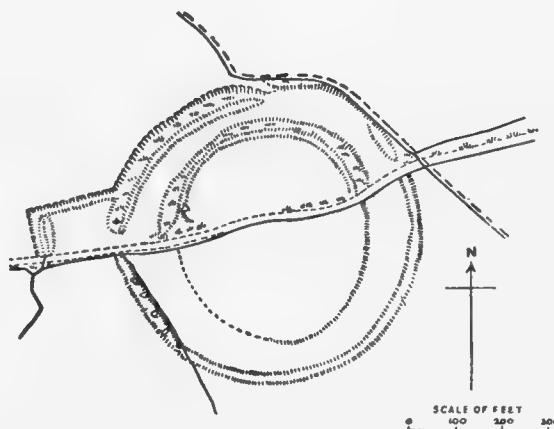


TINTAGEL, WILLAPARK.

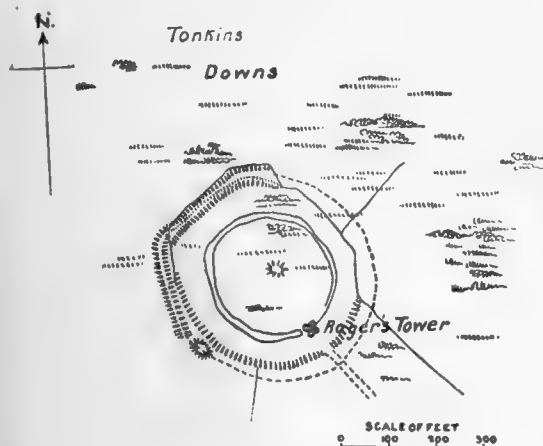
CLIFF CASTLES, LIST I.



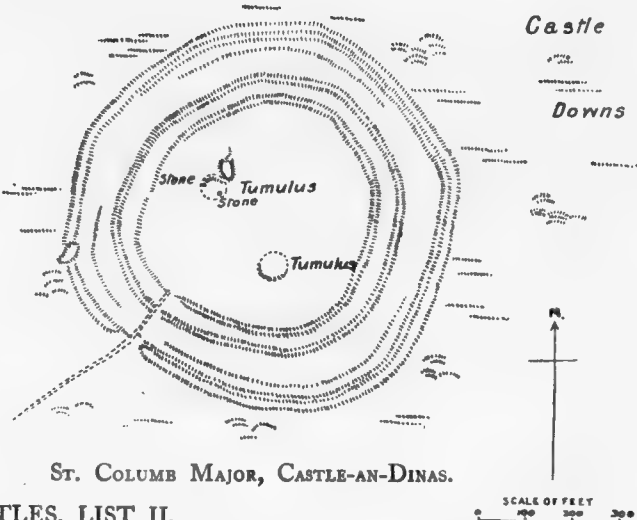
BODMIN, CASTLE CARNYKE.



EGLOSHAYLE, KILLIBURY.



LUDGVAN, CASTLE-AN-DINAS.



ST. COLUM MAJOR, CASTLE-AN-DINAS.

HILL CASTLES, LIST II.

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the editor of Drew's *History* (ii. 287) with Dingerein Castle in Gerrans (q.v.), but there can be little doubt but that Leland meant the Dodman which is about a mile from Penare, and which Tonkin says 'is separated from the village (Penarth) by a double entrenchment yet pretty entire running from cliff to cliff, and cutting off about 100 acres of coarse ground. The entrenchment is about 20 feet broad and 24 feet high in most places, but the outer wall is the least high. The people call it Thica Vosa, which is the vallum, and the Hack and Cast fabling it to be the work of a giant who performed the whole in one night. They also show a hole in the cliff which opens into a hollow below formed by the sea' [*Lysons*, ccxlvii. ; *Bulwark*, Penare, O.S. lxvi. 8]

ST. JUST IN PENWITH.—'Kenidjack Castle' [*Borlase*, 344 ; *Polwhele*, 112 ; *Buller*, 79 ; *Edmonds*, 41 ; *Daniel*, 218 ; *R.I.C.* (1869), iii. 108 (with plan) ; *P.N.H. & A.S.* i. 344, O.S. lxvii. 13]

'Boscaswell.' Dr. Borlase (*Antiquities*, 344) mentions a cliff castle here, but it must have been completely obliterated, as no trace now exists. It is difficult to see a suitable headland. Polwhele, who also mentions it, apparently was copying from Dr. Borlase.

ST. KEVERNE.—At Carrag Luz near Arrowan, Kennack Bay [O.S. lxxxv. 2]

At Chynhalls Point near Coverack [*Thomas*]

ST. LEVAN.—'Castle Treryn.' The Logan Rock. The lines of entrenchment here are most conspicuous and interesting [*W. of Worcester* ; *Leland* ; *Borlase*, 344 ; *Polwhele*, 113 ; *Drew*, ii. 415 ; *Gilbert* ; *C.A.A.* 31, 34, 35 ; *Blight List* (with plan) ; *Daniel*, 220 ; *P.N.H. & A.S.* i. 343, O.S. lxxviii. 11]

At Tol Pedn Penwith. Dr. Borlase describes this as a cliff castle. McLauchlan [*R.I.C.* 29th Rep. (1847), p. 37] says that in 1837 there were some stones remaining which formed part of the entrenchment, but they were gone, and there was very little appearance of fortification in 1847. Now there is only a low fence cutting off the main mass of the cliff, but it has none of the features of a defensive work [*Borlase*, 344 ; *Polwhele*, 113 ; *Daniel*, 219]

ST. MINVER.—At Rumps Point, Pentire [*Maclean*, iii. 6, O.S. xviii. 4]

At Doyden Point, Portquin

SCILLY.—'The Giant's Castle' on St. Mary [*The Scilly Islands*, by Dr. Borlase ; *Heath's Account of Scilly* (1750), map, O.S. lxxxvii. 12]

SENNEN.—'Maen Castle.' Leland does not actually mention this as a castle. The passage is, 'Tredrine Castel ruins at the South-west point of Penwith : manifesta ad huc extant vestigia' (this is clearly Treryn in St. Levan). 'I hard say that one Myendue was lord of it.' Maen Dhu means the Black Rock, and the headland which is Maen Castle, just north of the Land's End, is called Pedn Maen Dhu. Clearly Leland was misled by failing to understand his informant, who perhaps spoke the Cornish language [*Leland* ; *Edmonds*, 41 ; *R.I.C.* (1864), vol. i. pt. 2, p. 8 (with plan) ; *P.N.H. & A.S.* i. 344, O.S. lxxiii. 13]

TINTAGEL.—At Willapark Head [*R.I.C.* (1902), xv. 111 ; *Maclean*, i. 583. Very obscure, O.S. x. 9]

ZENNOR.—Bosigran Castle. Only classed as a cliff castle in recent years and of doubtful accuracy. The work is an insignificant piece of walling, and there is no ditch [*P.N.H. & A.S.* (1884), new ser. i. 311, O.S. lxvii. 3]

Gurnard's Head. There is a bank with a ditch across the narrowest part of the headland, now quite insignificant, but clearly artificial [O.S. lxia. 16]

LIST II

HILL CASTLES

BODMIN.—'Castle Carnyke.' On the west of the road to Bodmin Road Station. Mr. McLauchlan suggests a relation between this, Castle-an-Dinas (in St. Columb), and Bury Down (in Lanreath), but it is improbable [*Pol.* 80, 108 ; *Lysons*, ccxlviii. ; *Whitaker* ; *Daniel*, 143 ; *R.I.C.* 31st Rep. (1849), p. 19 and plan ; *Maclean*, i. 114 and plan, O.S. xxxiv. 7]

BREAGE.—'Pencair,' on Tregoning Hill [*Pol.* 113 ; *Lysons*, ccxlix. (quoting *Whitaker*) ; *Daniel*, 196 ; *R.I.C.* 45th Rep. (1863), p. 58 and (1890), x. 231 ; *P.N.H. & A.S.* (1888), new ser. ii. 332 ; *Drew*, ii. 108, O.S. lxxv. 3]

ANCIENT EARTHWORKS

- EGLOSHAYLE.**—'Killibury' or 'Kelly Rounds' [*W. of Worcester*; *Hals*; *Lysons*, ccxlviii.; *Drew*, ii. 216; *R.I.C.* 31st Rep. (1849), p. 25 and plan, and (1890), x. 231, and (1902), xv. 112; *Maclean*, i. 114, 404 and plan, O.S. xxv. 4]. Mr. Iago considers this a British camp, against which the Roman camp at Tregilders (St. Kew) was thrown up
- EGLOSKERRY.**—'Tregeare Beacon' [*R.I.C.* (1902), xv. 110, O.S. xii. 13]
- ILLOGAN.**—Carn Brea. The mason-built tower and ruins of this hill have probably no relation to the entrenchments. There is a great number of hut-circles on this hill, most of which are inside the lines of defence. Excavations in these were carried out in 1894 by Mr. T. C. Peter, who found large quantities of flint implements and other neolithic remains [*R.I.C.* (1895), xiii. 92 and map; *Reliquary* (new ser.), i. 190, and (new ser.) ii. 45, 108]. But as similar hut-circles are to be seen on many of the hills, and in some cases, as on the Caradons and Mulfra, where there are no entrenchments, it is probable that there is no relation between the huts and the military works [*W. of Worcester*; *Borlase*, 351; *Drew*, i. 202 and ii. 332; *Daniel*, 204; *C.A.A.* 29; *R.I.C.* (1895), xiii. 92, O.S. lxiii. 6]
- LELANT.**—On Trencrom Hill [*Pol.* 112; *Gilbert*; *Drew*, ii. 636; *Daniel*, 213; *Edmonds*, 38; *P.N.H. & A.S.* i. 342, and (1883), new ser. i. 198, and *Trans.* (1893-8), 109, O.S. lxviii. 8]
- LUDGVAN.**—'Castle-an-Dinas.' The tower on this hill was built about 1798 [*Borlase*, 346; *Pol.* 112; *Gilbert*; *Daniel*, 213; *Drew*, i. 426 and ii. 429, 636; *Edmonds*, 37; *Archæologia*, xxii.; *Gent. Mag.* xxii.; *P.N.H. & A.S.* i. 342, and (1890), new ser. iii. 208, and (1891), 308, O.S. lxviii. 6]
- MADRON.**—'Lesingey Round,' near Castle Horneck between Lesingey and Polgoon [*Polwhele*, 112; *Drew*, ii. 437; *Edmonds*, 39; *P.N.H. & A.S.* i. 343, O.S. lxxiv. 1]. From the situation, which is much like Restormel, traces of a mediaeval castle might be expected here, but none are known
- MENHENIOT.**—Blackaton Rings [*Lysons*, ccxlviii. as in Morval; *Daniel*, 106, O.S. xlv. 3]
- MICHAELSTOW.**—'Helsbury Beacon.' There are remains of a small rectangular enclosure inside the ramparts [*W. of Worcester*; *Gilbert*; *Drew*, ii. 485; *R.I.C.* (1902), xv. 112; *Maclean*, i. 114, and ii. 557 and plan; McLauchlan suggests that this may be 'Dameliock'; see Tregeare in St. Kew; *R.I.C.* 32nd Rep. (1850), p. 37 and plan, O.S. xx. 2]
- MORVAH.**—'Chyoone Castle' [*Borlase*, 346 and plan; *Pol.* 112, and bk. ii. ch. iv. p. 134; *Gilbert*; *Drew*, i. 426; *Daniel*, 214; *C.A.A.* 44-6; *Arch. Camb.*; *Edmonds*, 35; *P.N.H. & A.S.* i. 341, ii. 84; i. new ser. (1884), 312, (1891), iii. 302, 308, 320, and (1893-8), 85. Half in Madron and half in Morvah according to O.S. lxvii. 11]. This differs from all the other castles in the character of the dry stone walling with which the ramparts are faced. On the occasion of the visit of the Cambrian Archaeological Association in 1862, Professor Babington said, 'It is a kind of building, as far as I know, peculiar to Cornwall; I am unable to name an instance elsewhere.' Mr. Hussey Vivian (President C.A.A.) on the same occasion compared the ground plan with Restormel, and suggested that the mediaeval castle might be an imitation. The plan is figured in Dr. Borlase's work on the 'Antiquities of Cornwall.' Round the inside of the main wall is a series of small enclosures now marked by dwarf walls in ruins. In 1895 one of these was thoroughly searched by the members of the Penzance Natural History and Antiquarian Society. They found in the middle of the floor a large flat stone with a circular pit in the centre, evidently used for grinding, and beside this stone a pit full of ashes of burnt furze. Scattered everywhere was a quantity of small rounded beach pebbles, suited for use as slingstones
- PENZANCE.**—'Castle Lescudjack.' This and Lesingey in Madron, though invisible to one another, overlook the site of the present town of Penzance, the one on the west and the other on the east side. They have only single entrenchments [*Hals* (sub Madron); *Polwhele*, 112; *Drew*, ii. 437; *Edmonds*, 39; Lescudjack Hill of O.S. lxxiv. 2, Madron Parish]
- ST. COLUMB MAJOR.**—'Castle-an-Dinas.' This from the size, character and position may be considered the finest and most typical of the hill castles. *W. of Worcester* speaks of one 'Tador' Duke of Cornwall being killed here. The chroniclers mention a Theodoric, King of Cornwall about 460 A.D. (*Borlase*, 407) [*W. of Worcester*; *Leland*; *Carew*, 85, 143; *Hals*; *Polwhele*, 110, and ch. xi. 210; *Lysons*, ccxlix. and plan; *Drew*, i. 429-33, ii. 166; *Daniel*, 182; *R.I.C.* 31st Rep. (1849), p. 25 and plan; *Maclean*, i. 114, O.S. xxxiii. 13]

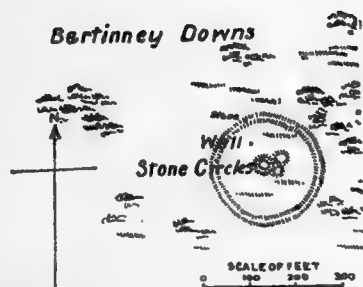
A HISTORY OF CORNWALL

- ST. DENNIS.—(Site of church) [*Lysons*, ccxlix. ; *Drew*, ii. 207 ; *R.I.C.* 31st Rep. (1849), p. 26 and plan ; *R.I.C.* (1902), xv. 108, O.S. xli. 9]
- ST. GERMANS.—‘Padderbury’ [*Lysons*, ccxlviii. ; *Daniel*, 115, O.S. xxxvi. 16]
- ST. JUST IN PENWITH.—Bartinney Hill [*Borlase*, 346 ; *Polwhele*, i. 113 ; *Lysons*, ccxlix. ; *Drew*, i. 426 ; *Edmonds*, 38 ; *P.N.H. & A.S.* i. 343, O.S. lxxiii. 7]. Within the area are some rough stone circles
- ST. NEOT.—Bury Down [*Lysons*, ccxlvii. ; O.S. xxvii. 15] ; some slight outworks on south side. Within the area are several circles
- SANCREED.—‘Caer Brane’ [*Borlase*, 346 ; *Polwhele*, 113 ; *Paris*, 49 ; *Drew*, i. 426 ; *Edmonds*, 38 ; *P.N.H. & A.S.* i. 342 ; (1892), new ser. iii. 25, O.S. lxxiii. 7]
- WARBISTOW.—‘Warbistow Burrows.’ *Tonkin* [*Lysons*, ccxlix. and plan ; *Drew*, ii. 666 ; *Daniel*, 149 ; *R.I.C.* (1902), xv. 110 (with plan) ; *Pol.* bk. i. ch. xi. p. 210 ; Warbistow Bury, O.S. xi. 7]. ‘A noble fortification’

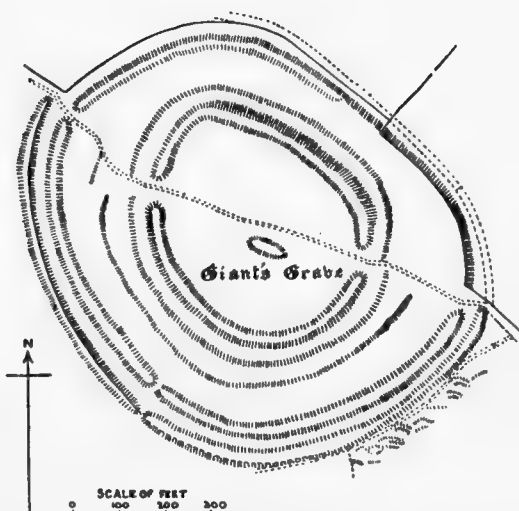
LIST III

DIVISION I.—DEFENSIVE ENCLOSURES HAVING TWO OR MORE LINES OF ENTRENCHMENT, OUTWORKS, OR COURTS

- BRADDOCK.—In Largin Wood. Some of the outworks may be due to the fighting which took place about this part of Cornwall in the Civil Wars [O.S. xxxv. 6]
- CARDINHAM.—‘Cardinham Castle’ [*Polwhele*, 107 ; *Drew*, ii. 151 ; *Daniel*, 117 ; *R.I.C.* 32nd Rep. (1850), p. 36 and plan, O.S. xxvi. 16]
‘Bury Castle,’ 1 mile north-east of church [*Lysons*, ccxlix. ; *Drew*, ii. 151 ; *Daniel*, 117 ; *R.I.C.* 32nd Rep. (1850), 35 and plan ; *Maclean*, i. 114, O.S. xxvii. 9]
- EGLOSHAYLE.—At Pencarrow [*Hals* ; *Polwhele*, 80, 108 ; *Lysons*, ccxlviii. ; *Drew*, ii. 216 ; *R.I.C.* 31st Rep. (1849), 23 and plan ; *R.I.C.* (1902), xv. 112 ; *Maclean*, i. 404 and plan, O.S. xxvi. 9]
- FEOCK.—Near Tregew [O.S. lxv. 5]. This is almost a ‘Cliff Castle.’
- GOLANT, ST. SAMPSON.—‘Castle Dore.’ Identified by some writers as the ‘Croftededor’ of Domesday Book. Mentioned by William of Worcester as ‘Castle Dirford’ ; he says it was then in ruins. There may have been a mediaeval castle here. It was used as a fort in the Civil War [*W. of Worcester* ; *Leland* ; *Borlase*, 334 ; *Polwhele*, 79, and bk. i. ch. xi. p. 207 ; *Drew*, ii. 596 ; *Rashleigh*, 5, 13, 17 ; *R.I.C.* 31st Rep. (1849), p. 29 and plan ; *Maclean*, i. 114, O.S. xli. 4]
- HELLAND.—At Penhargard, ‘The Castle.’ There is a circular camp with single dyke about a quarter of a mile north-east of this [*R.I.C.* 32nd Rep. (1850), p. 36 and plan ; *Maclean*, ii. 5 and plan, O.S. xxvi. 9]
- LANTEGLOS BY CAMELFORD.—‘Castle Goff’ [*R.I.C.* 32nd Rep. (1850), p. 39 and plan ; *R.I.C.* (1902), xv. 111, O.S. xiv. 10]
- LAUNCELS.—‘Leighbury’ at Leigh Wood [*Lysons*, ccxlvii. ; *R.I.C.* 34th Rep. (1852), p. 21 and plan, as ‘The Bury’ ; *R.I.C.* (1902), xv. 113, O.S. iv. 13]. There are three oval camps in a line
- LUXULIAN.—At Prideaux near St. Blazey [*Lysons*, ccxlviii. ; *Drew*, ii. 432, O.S. xlii. 14]
- PAUL.—At Tredavoe [*Blight List* with plan (inaccurate), nearly destroyed. Not in ordnance map]
- PELYNT.—‘Hall Rings’ at Bury Park [*Borlase* ; *Nat. Hist.* 325 ; *Lysons*, ccxlviii. ; *Gilbert* (sub Talland) ; *Bond*, 67 ; *R.I.C.* 28th Rep. (1846), p. 19 and plan, O.S. xliii. 16]
Near St. Annes (or St. Ninnies) well [*R.I.C.* 28th Rep. (1846), p. 28 and plan, O.S. lxiv. 13]
‘Bake Rings’ [*R.I.C.* 28th Rep. (1846), p. 31 and plan, O.S. xliii. 15]
- PERRANZABULOE.—‘Caer Kief’ [*Tonkin* ; *Whitaker* ; *Lysons*, ccxlix. ; *R.I.C.* 29th Rep. (1847), p. 29 (as Caer an Kledh) and plan ; *Pol.* bk. i. ch. xi. p. 211, O.S. xlviii. 10]
‘Caer Dane,’ Lambourne Castle [*Lysons*, ccxlix. ; *R.I.C.* 29th Rep. (1847), as Lan-bron, and plan ; *Pol.* bk. i. ch. xi. p. 211, O.S. xlviii. 10]
- ST. ALLEN.—At Bishops Wood, near Gwarnick [*Hals* ; *Pol.* 108 ; *Lysons*, ccxlix. ; *Drew*, ii. 25 ; *R.I.C.* 29th Rep. (1847), p. 46, O.S. lvii. 4]
- ST. GERMANS.—At Perdredda Wood [O.S. xlv. 9]
- ST. JULIOT.—‘Tremorle Ring’ near Cargurra [*R.I.C.* (1902), xv. 114, O.S. x. 8]
- ST. KEW.—‘Tregeare.’ Mr. Iago considers this a British camp against which the ‘Roman’ camp at Trewinnick was thrown up [see *R.I.C.* (1890), x. 229 ; *R.I.C.* (1902), xv.

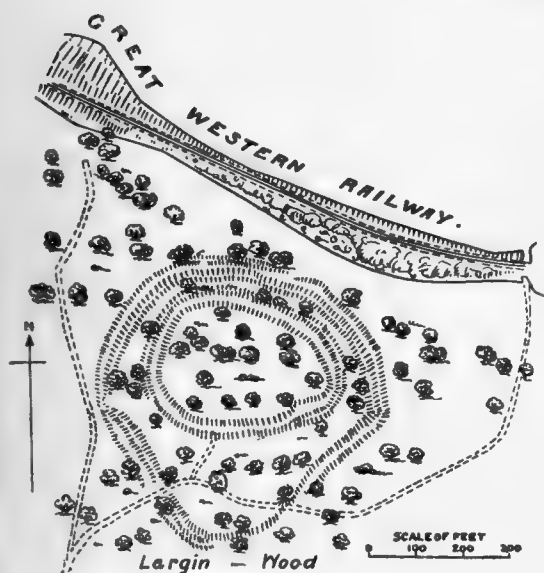


ST. JUST IN PENWITH, BARTINNEY.

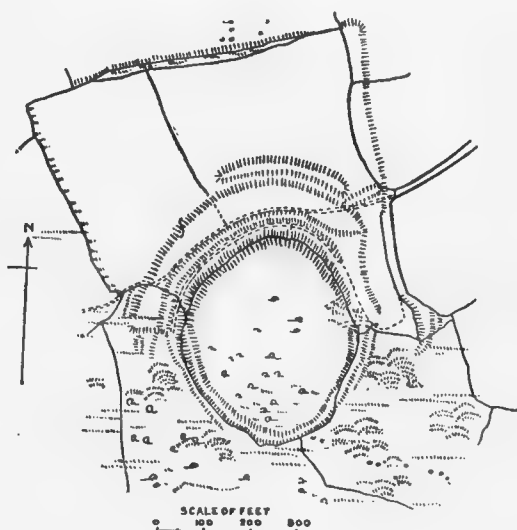


WARBSTOW BURROWS.

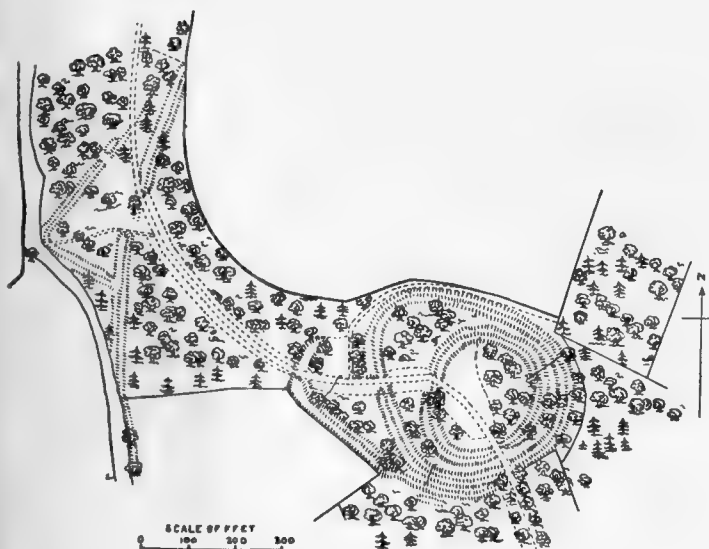
HILL CASTLES, LIST II.



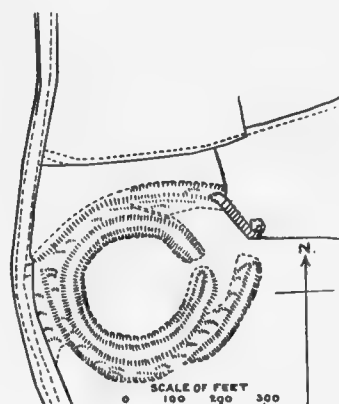
BRADDOCK, LARGIN CASTLE.



CARDINHAM, BURY CASTLE.



EGLOSHAYLE, PENCARROW.



GOLANT, ST. SAMPSON,
CASTLEDORE.

DEFENSIVE ENCLOSURES, LIST III., DIVISION I.

A HISTORY OF CORNWALL

111; *Maclean*, ii. 5 and plan, 80, O.S. xix. 4]. This is marked in the ordnance map as Damelock, the castle which figures in the King Arthur legend (see *Hals*, sub Dundagell), but on what authority? See Helsbury Beacon, Michaelstow. There is a camp called Demelza in St. Wenn, and see *Hals* (sub St. Tudy). Excavated in 1902 by Messrs. Burnard and Baring-Gould. Slingstones, rusty iron and pottery were found, but not enough evidence to justify any conclusions as to date or origin, except that there was no trace of Roman influence.

ST. STEPHEN IN BRANNEL.—‘Trethullian Castle’ [O.S. l. 10]

‘Resugga Castle,’ faint traces [*Lysons*, ccxlix. ; *R.I.C.* 30th Rep. (1848), p. 22 and plan [O.S. l. 9]

ST. THOMAS (Launceston).—At Kestle Wood [*R.I.C.* (1902), xv. 110 and plan. A drawing of this camp was presented to the Truro Museum in 1852 by Mr. S. R. Pattison, 34th Rep. (1852), p. 23, O.S. xvi. 7]

TINTAGEL.—At Bosinney village [*R.I.C.* 34th Rep. (1852), p. 19 and plan ; *Maclean*, iii. 215, Trevenna, O.S. x. 13]. There is a large circular mound of earth on the site

LIST III

DIVISION II.—DEFENSIVE EARTHWORKS WITH SINGLE BANKS

BODMIN.—At Dunmere Wood [*Lysons*, ccxlviii. ; *R.I.C.* 31st Rep. (1849), p. 24 and plan ; *R.I.C.* (1890), x. p. 227 ; *Maclean*, i. 114 and plan, O.S. xxvi. 13]

CALLINGTON.—‘Castlewitch’ [*Daniel*, 107 ; *R.I.C.* (1902), xv. 114, O.S. xxix. 14]

CAMBORNE.—‘Treyeur’ at Drym [*Drew*, ii. 142, mentions these two camps, but probably by mistake for Tregear and Drym in Crowan]

COLAN.—Near Mellancoose [O.S. xl. 2]

CONSTANTINE.—At Carwythennack. Nearly obliterated [*Pol.* 124, O.S. lxxvi. 8]

At Merthen. There are two large square-sided entrenchments, end to end, looking down the Helford to the open sea near Polwheveral Creek [O.S. lxxvii. 9]

Circular camp at Nancenoy [O.S. lxxvii. 5]

CREED.—At Trevillick, 1 mile north-east of Grampound [*R.I.C.* 30th Rep. (1848), p. 19 and plan]

One mile north-east of St. Ewe Church [*R.I.C.* 30th Rep. (1848), p. 21 (as Pen-coose) and plan [O.S. lix. 6]

CROWAN.—‘Tregear’ at Church Town [*Drew*, ii. 191, O.S. lxx. 5]

At Drym. This is included here on the authority of *Drew*, ii. 191. Drym is near Nancegollan station, but there is now no trace or record of a camp

CUBERT.—One mile south-east of church [O.S. xxxix. 15]

CURY.—Near Polwyn. Some remains in 1842 [*Thomas*, O.S. lxxx. 3, Burncoose]

DAVIDSTOW.—One mile south of Otterham station [O.S. xi. 9]

GERRANS.—At St. Anthony’s Point. This is included in this list as it is rather a camp on the cliff than a cliff castle [O.S. lxxii. 13]

‘Dingerein Castle.’ In *Drew*, ii. 287, this is identified with the ‘forte’ mentioned by Leland as being ‘a myle by west of Penare in the paroch of St. Gorans,’ but it is more probable that Leland was referring to the Dodman (see St. Goran in List I) [*Tonkin* ; *Drew*, ii. 287, 289 ; *Daniel*, 176, O.S. lxxv. 5]

GOLANT, ST. SAMPSON.—‘Mount Dwen.’ This is close to Castle Dore near Little Pinnick (see Golant, Division I.), but a much more primitive work [*Rasleigh*, 5, O.S. li. 4]

GWENNAP.—At Trebowland Augear [O.S. lxiii. 16]

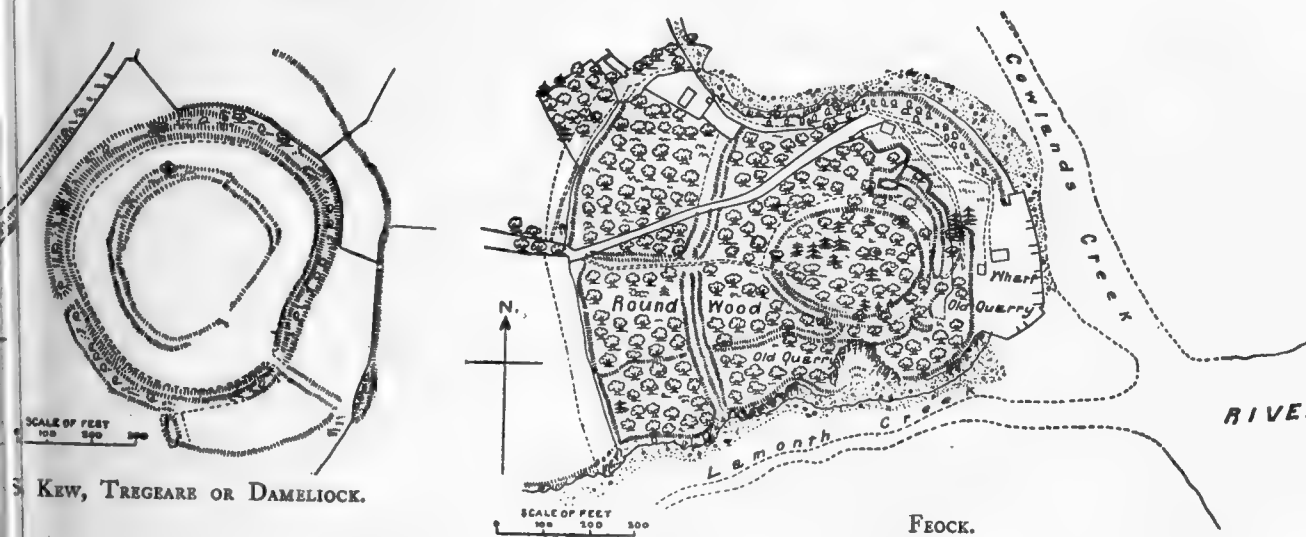
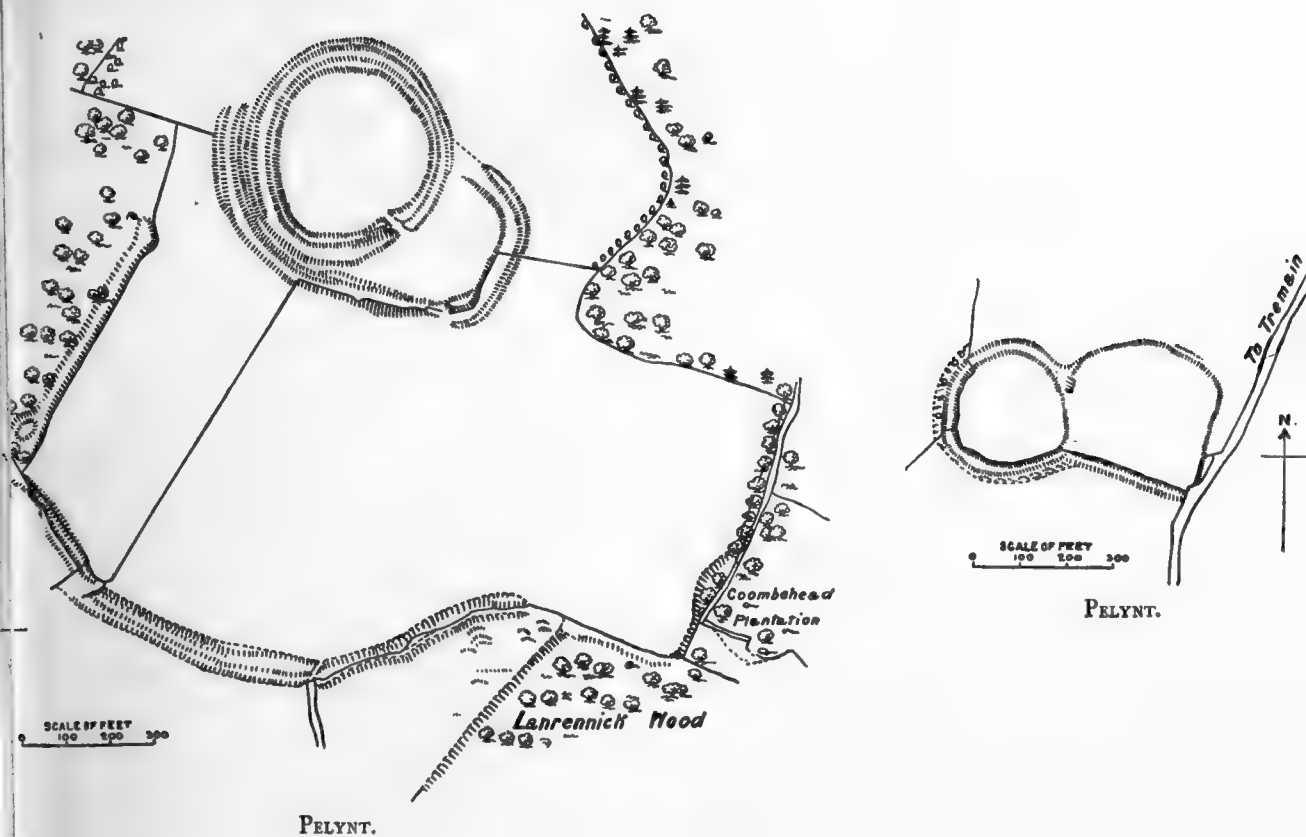
GWINEAR.—At Coswinsawsen [*P.N.H. & A.S.* (1882), new ser. i. 129, and (1888), new ser. ii. 193, 195, O.S. lxii. 16]

GWITHIAN.—‘Trevarnon Round’ was possibly used in the Civil War. A cannon ball has been dug up. It is more than half ploughed down [*Drew*, ii. 311 ; *P.N.H. & A.S.* (1882), new ser. i. 128, and (1888), new ser. ii. 193, O.S. lxii. 10]

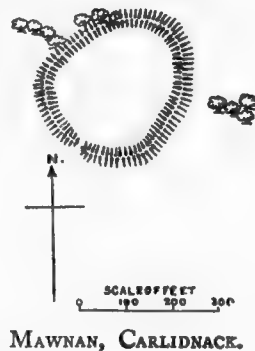
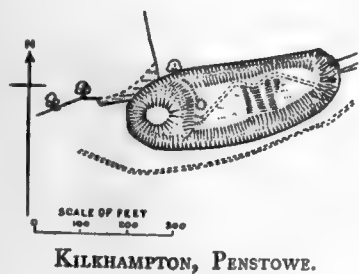
HELLAND.—At Penhargard, near the castle (see Division I. and compare ‘Castle Dore’ and ‘Mount Dwen’ in Golant) [*R.I.C.* 32nd Rep. (1850), p. 36 and plan ; *Maclean*, i. 114, ii. 5, and plan, O.S. xxvi. 10]

HELSTON.—‘Castle Wary’ or ‘Wera’ near Nansloe [*Hals* ; *Drew*, ii. 317]

The Bowling Green. *Drew’s Hist.* (i. 637) says as on the authority of W. of



DEFENSIVE ENCLOSURES, LIST III., DIVISION I.



DEFENSIVE EARTHWORKS, LIST III., DIVISION II.

A HISTORY OF CORNWALL

Worcester that there was a castle here, the residence of Edmund, Earl of Cornwall. But as W. of Worcester includes Treryn in St. Levan (List I.) and Castle-an-Dinas in St. Columb (List II.) in the same list, it may not have been a mediæval castle. Nor does he say that Edmund resided here; his statement is 'C. Helston dirutum: comes Cornubiæ Edmundus' (cf. his reference to Restormel, 'ubi manebat')

ILLOGAN.—Near Portreath [*Leland*, O.S. lvi. 14. Nance Wood]

KEA.—At Tregullas, perhaps used as a Plane-an-Gwarre in later times [*R.I.C.* 29th Rep. (1847), p. 33 and plan, O.S. lxiv. 3]

At Goodern [*R.I.C.* 29th Rep. (1847), p. 35 and plan]

KENWYN.—At Chyvelah " " " p. 42 " (as Gwyloweth) 2½ miles west of Truro on the road to Chacewater

At Govers [*R.I.C.* 29th Rep. (1847), p. 43 and plan (as Pentinney), 1 mile N.N.E. of Chyvelah, O.S. lvii. 10, 11, 15]

At Langarth, 1 mile N.N.W. of Chyvelah

At Halgaras near Short Lanes End [*R.I.C.* 29th Rep. (1847), p. 43 and plan, O.S. lvii. 3]

Supposed site of castle (the present Cattle Market) [O.S. lvii. 12]

There was a camp at Gwarnick, 1 mile north of Short Lanes End, which was destroyed about 1790 [*R.I.C.* 29th Rep. (1847), p. 44 and plan]

KILKHAMPTON.—At Barnacott. Probably the one referred to in *Pol.* 106 [O.S. iii. 12]

At Stowe Wood [*R.I.C.* (1902), xv. 113, O.S. iii. 4; and Winwood Castle, *Lysons*, ccxlvii, O.S. iv. 1. Winsewood Castle]

'Penstowe Castle.' The area is completely filled by three high mounds of earth [O.S. iii. 4]

One mile east of Church Town [O.S. iv. 2]

LADOCK.—At Greens [O.S. xlix. 15 and 16]

At Tregeare [O.S. xlix. 14]

LANREATH.—At Bury Down [Borlase, in *Nat. Hist.* 325, mentions two here, but only one can be traced now; *Maclean*, i. 114; *Lysons*, ccxlviii., says this had a double vallum and there was a small triangular camp 800 feet away to the south-east, O.S. xliii. 7]

At Carwen, almost destroyed [*R.I.C.* 28th Rep. (1846), p. 30 and plan]

At Castle Mawgan, not marked on ordnance map. Included here on the authority of *Polwhele*, who says (p. 120): 'To the East of Fowey, we have Castle Mawgan and the promontory of Pencarrow.' But it is possible that he was allowing himself to be guided by the names only

LANTEGLOS BY CAMELFORD.—'Newbury' near Helstone [*R.I.C.* (1902), xv. 111, O.S. xiv. 15]

LAUNCELLS.—At Brays Hill [*R.I.C.* (1902), xv. 113, O.S. vi. 5]

LAWHITTON.—At Cal Hill near Church Town [*R.I.C.* (1902), xv. 114, O.S. xvii. 9]

LEWANNICK.—At Trelaske Wood [*R.I.C.* (1902), xv. 113, O.S. xvi. 15]

At Trethinna [*R.I.C.* (1902), xv. 113, O.S. xvi. 10]

'Upton Castle.' This is a small circular work enclosing two square-sided structures built of small stones. The ramparts were made of blocks of elvan laid in horizontal courses without mortar [*R.I.C.* vol. iii. No. xii. p. 30; Rep. (1871), p. 73; (1888), ix. 344 and plan; (1902), xv. 114, O.S. xxii. 1]. *Polwhele* mentions five in this district by the names 'Ridgehill,' 'Bastreet,' 'Caerneglos,' 'Dryworks' and 'Deep hatches,' all of which he calls Roman

LEZANT.—At Carthamartha Wood [*R.I.C.* (1902), xv. 114, O.S. xxiii. 3]

At Castle Park Hill [*R.I.C.* (1902), xv. 114, O.S. xxiii. 2. Grey Stone Wood]

LINKINHORNE.—'Roundbury,' near Browda [*R.I.C.* (1902), xv. 114, O.S. xxviii. 4]

At Church Town [*R.I.C.* (1902), xv. 114, O.S. xxii. 16]

LISKEARD.—'Roundbury.' This camp is in a field 1 mile north of Liskeard where the St. Cleer road branches off at right-angles eastward to Launceston. Worn down by ploughing it might be easily overlooked [O.S. xxxvi. 2]

LUXULIAN.—At Innis Downs, 2 miles south-west of Lanivet [O.S. xxxiii. 16]

MADRON.—Trewern Round [*Edmonds*, 39, O.S. lvii. 16]

MANACCAN.—At Rosemorder [*Pol.* 125. Entrenchment at Tregidden, O.S. lxxxi. 2]

Near Trenower

Thomas marks the following:

At Kestle

At Treath

ANCIENT EARTHWORKS

At Carply [O.S. Carplight, lxxxi. 1]

At Treworgie

At south-east of Rosemorder

MARHAMCHURCH.—At Walesborough. Not marked in the ordnance map. Included here on the authority of *Borlase*, 112 [*Pol.* 107 ; *Drew*, ii. 449 ; more probably the site of an ancient chapel, *Lysons*, ccxlvii.]

MAWGAN IN MENEAGE.—At Carlidna

South of Gweek. This, which is on the edge of a hill looking over the creek, is a round camp, while the others which command these creeks (see Wendron and Constantine) are square [*Drew*, ii. 451 ; *Daniel*, 198, O.S. lxxvi. 12]

MAWGAN IN PYDER.—At Carloggas [*W. of Worcester*]

MAWNAN.—At Carlidnack [O.S. lxxvii. 3 and 4]

MINSTER.—At Boscastle. This is supposed by some to be the site of Bottreaux Castle, and there may have been a mediaeval castle here. There is no trace of such a building, and even *W. of Worcester* is vague. He speaks of 'Castrum vocatum Botreaux Castel' [*Drew*, ii. 491 ; *Gilbert* ; *Daniel*, 152 ; *R.I.C.* 34th Rep. (1852), p. 19 and plan] ; Forrsbury Common, O.S. x. 7]

At Slaughter Bridge there are traces of earthworks, at the junction of the rivers above the bridge [*R.I.C.* 32nd Rep. (1850), p. 39 and plan]. This is the legendary site of the battle in which King Arthur was mortally wounded

NEWLYN.—Near Cargoll [O.S. xxxix. 16]

At Trewinnon Camp [O.S. xl. 14]

NORTH HILL.—'Rings Camp' near Coad's Green [*R.I.C.* (1902), xv. 114, O.S. xxii. 7. Trefuge]

'Killabury,' at Newton [*R.I.C.* (1902), xv. 114, O.S. xxii. 7]

'Alabury' near Trebartha " " " See note under Lewannick [O.S. xxii. 10]

PAUL.—'The Roundago' at Kerris [*Borlase*, 198 (plan at 206) ; *Pol.* bk. ii. ch. iv. 193 ; *Paris*, 70 ; *Drew*, i. 131 ; *Daniel*, 217 ; *Edmonds*, 16 ; *Næn. Corn*, 176 ; *P.N.H. & A.S.* (1890), new ser. iii. 215]. Not marked in ordnance map

'The Round' at Castallack [*R.I.C.* (1865), vol. i. p. i. ix. 66 with plan]. Nearly destroyed

PERRANZABULOE.—'Round' at Penhallow [O.S. xlviii. 14]

At Tresawsen [*R.I.C.* 29th Rep. (1847), p. 29 and plan ; *Pol.* bk. i. ch. xi. p. 211 calls this 'a double entrenchment,' O.S. lvii. 2]

Near Engelley (Higher Gilley) [*Thomas* ; *R.I.C.* 29th Rep. (1847), p. 29 and plan (as Kerrowangilley)]. Not marked in ordnance map

Thomas marks remains of a camp near Lambourn, and of another 'nearly square' near Penwortha

PHILLACK.—'Castle Cayle' [*Leland* ; *Whitaker* ; *Gilbert* ; *Daniel*, 206 ; *Edmonds*, 39, 214 ; *P.N.H. & A.S.* i. 345, and (1882), new ser. i. 128, O.S. lxix. 6]

At Riviere. There is now no trace of this except the name. *Leland* said that in his time it was 'as sum think drounid with sand' [*Drew*, ii. 108, 555-6 ; *Daniel*, 206]

POUGHILL.—Stamford Hill is the site of an ancient earthwork and of Sir Beville Grenville's victory over the Parliament troops on 15 May 1653 [*Drew*, ii. 564 ; *R.I.C.* 34th Rep. (1852), p. 21 and plan, O.S. iii. 16]

POUNDSTOCK.—At Trebarfoot [*Borlase*, 312 ; *Polwhele*, 107 ; *R.I.C.* (1902), xv. 111 ; *Millook*, O.S. viii. 2]

PROBUS.—At Golden. The reference in *Leland* is to the manor house, not to the camp [*Borlase*, 312 ; *Lysons*, ccxlvii. ; *Polwhele*, 120, and vol. i. ch. xi. p. 209 ; *Whitaker* ; *Drew*, ii. 569 ; *R.I.C.* 30th Rep. (1848), p. 24 and plan, O.S. lviii. 8]

At Carvossa. There is a legend of a battle fought here between the Cornish and the Danes [*Lysons*, ccxlvii. ; *Tonkin* ; *Drew*, ii. 568 ; *R.I.C.* 30th Rep. (1848), p. 24 and plan ; *Pol.* bk. i. ch. xi. p. 209, O.S. lviii. 4]

At Resparva [*Drew*, ii. 569 ; *Pol.* bk. i. ch. xi. p. 209]

Near railway station

The following are not marked on the ordnance map, and are inserted here on the authority of *Drew*, ii. 569, as having been traceable (nearly circular) in 1824 ; and *Pol.* bk. i. ch. xi. p. 209 :

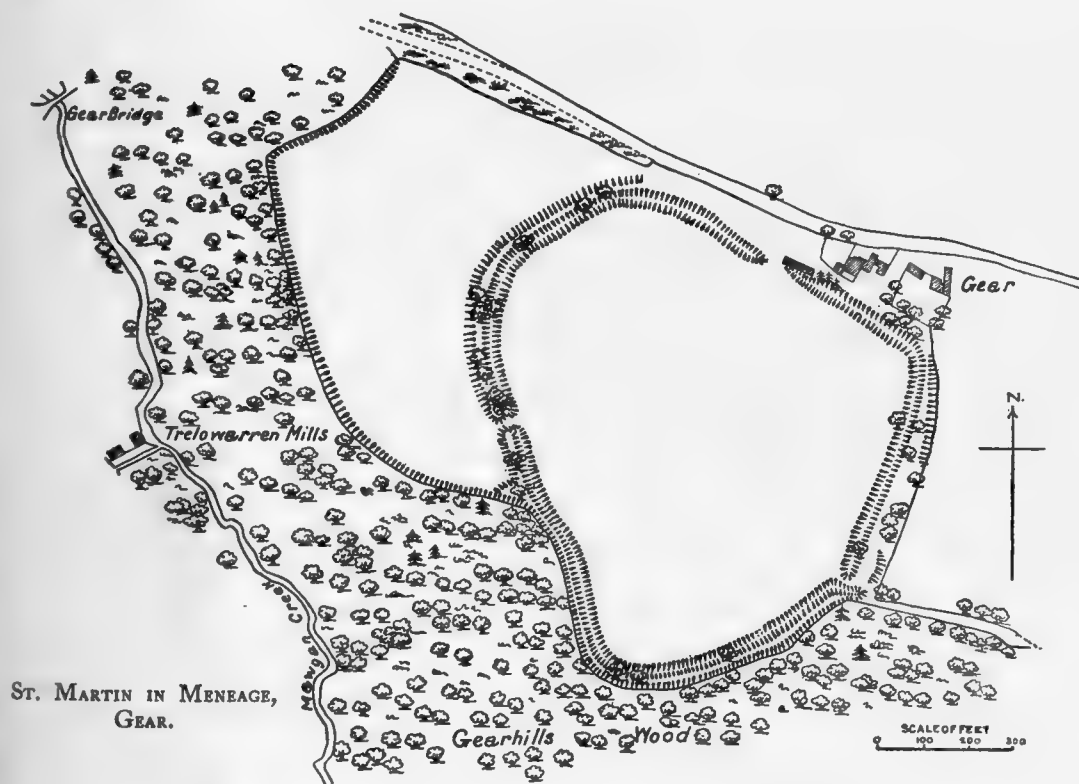
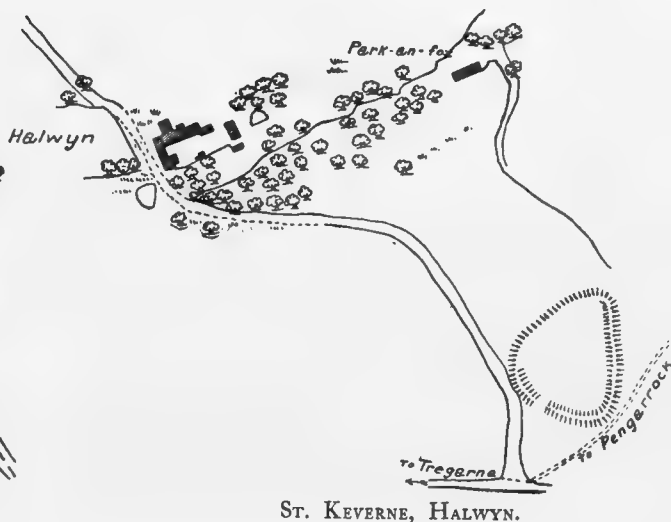
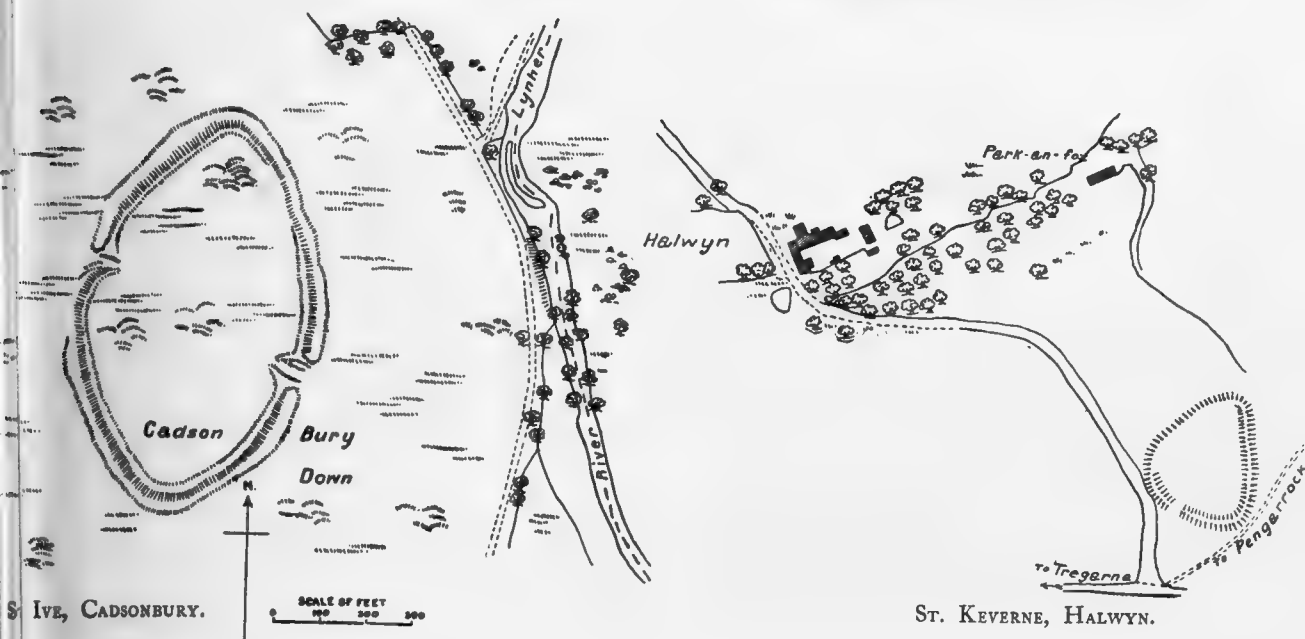
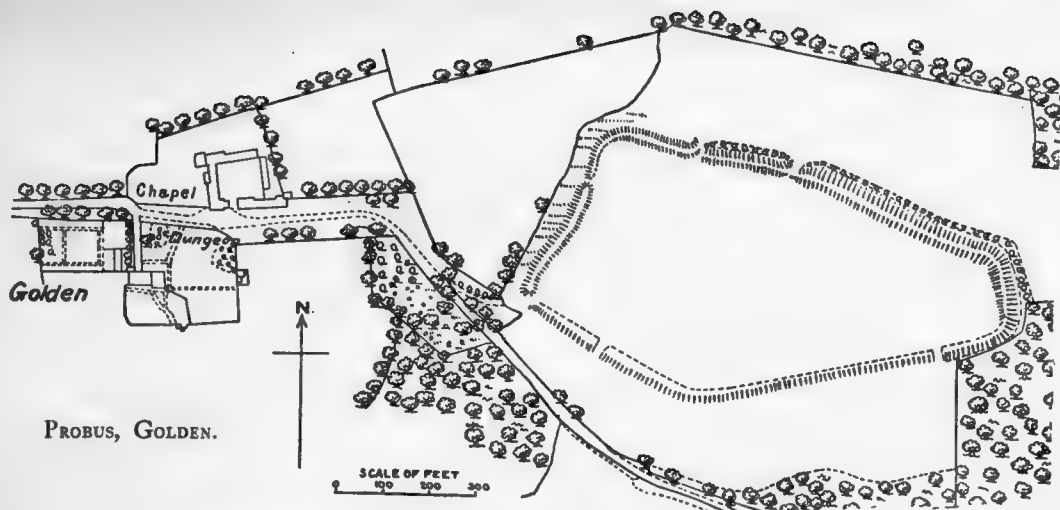
At Helland

At Trewithan

A little south of Church Town

A HISTORY OF CORNWALL

- QUETHIOCK.—At Hammett. In two fields much worn by the plough and almost obliterated [*R.I.C.* (1902), xv. 114, O.S. xxxvi. 4 and xxxvii. 1]
- ST. AGNES.—Thomas marks remains of camps at Trevisack and Mevagissey
- ST. ANTHONY IN MENEAGE.—At Gillybowls near Tregithey. Not marked on the ordnance map. Included here on the authority of *Hals* and *Pol.* 122. Thomas marks traces or remains of the following which are not marked on the ordnance map :—
 At Condurrow
 Between Trezebal and Higher Boden
 On a hill near Gillan Haven
 Near Gillan Haven
 East of Roskreeg farm
- ST. AUSTELL.—‘Castle Gotha’ near Penrice [*Lysons*, ccxlix ; *R.I.C.* 29th Rep. (1847), p. 19 and plan, O.S. li. 13]
- ST. BREWARD.—‘King Arthur’s Hall,’ at Emblance Downs. This is of a curious structure in having the stone facing on the inside of the walls or ramparts [*R.I.C.* 34th Rep. (1852), p. 22 ; (1895), xiii. 108 and plan ; *Maclean*, i. 352 ; *Norden* and plan]
- ST. BURIAN.—At Trewoofe ; a little south-west of the present farmhouse on the other side of the stream there is an artificial cavern or ‘fougou’ in a bank. There is no sign of any entrenchment to be seen now, but *Hals* speaks of traces being visible in his time [*Drew*, ii. 131 ; *C.A.A.* 34, 36 ; *Gilbert*, i. 143]
- ST. CLEMENT (Truro).—At Dinas, a quarter of a mile south of Church. (?) Castle Moresk [*R.I.C.* 29th Rep. (1847), p. 22 and plan, O.S. lviii. 12]
 At Tregurrow [*R.I.C.* 29th Rep. (1847), p. 23 and plan, O.S. lviii. 4]. Site of Castle Polwhele [see *W. of Worcester*, O.S. lviii. 9]
- ST. COLUMB MAJOR.—At Carnanton. Between the East Gate and St. Columb. Very little visible. This may be the ‘Castle Fust’ mentioned by *W. of Worcester* [*Pol.* 108 ; *Drew*, ii. 458, O.S. xxxii. 10. Lower Tresacole]
- ST. DOMINICK.—At Brendon Mill [O.S. xxix. 12]
- ST. ENODER.—At Goonhoskyn [*Pol.* 108, or the next as ‘Carvinnack,’ O.S. xl. 14]
 At Resparva [O.S. xlix. 2]
 At Summercourt [Near road from Summercourt to Penhale Round, O.S. xl. 15]
 Near Church Town [O.S. xl. 15]
- ST. ERME.—Carland and Coskeyle. Site of Killigrew [O.S. xlix. 5]
- ST. EARTH.—‘Carnabargus’ near (south of) vicarage [*Pol.* 112 ; *Gilbert* ; *R.I.C.* 29th Rep. (1847), and plan ; (1890), x. 243, O.S. lxix. 5]
 ‘Castle Menneck,’ at Tredrea [*R.I.C.* 29th Rep. (1847), p. 37 and plan]. Existing traces very faint
 There is a semicircular embankment at Hayle on a low promontory overlooking both estuaries, marked (O.S. lxix. 1) as a Cliff Castle, now used as a public walk. An inscribed stone said to have the date 500 was found here
- ST. ERVAN.—At Carnevas. There is now no trace of any camp. It is inserted on the authority of *Polwhele* (108). There may have been something visible in his time, or he may have been guided by the name only. His reference is ambiguous.
- ST. EVAL.—At Trevisker [O.S. xxxii. 2]
- ST. GENNYS.—At Tregayor [*R.I.C.* (1902), xv. 111, O.S. viii. 6]
 At Pengold ” ” ” O.S. viii. 13]
 At Resparrett ” ” ” O.S. xi. 1]
- ST. GLUVIAS.—Near the church. Site of camp [O.S. lxxi. 7]
- ST. GORAN.—At Castle Hill [*R.I.C.* 29th Rep. (1847), p. 30 and plan ; as *Golowras Pol.* bk. i. ch. xi. p. 208, O.S. lix. 16]
Pol. i. ch. xi. p. 208 mentions ‘a small round entrenchment at Bodrigan.’
- ST. ISSEY.—Half-mile south-west of church [O.S. xxiv. 12]
- ST. IVE.—‘Cadsonbury’ near Newbridge [*Lysons*, ccxlviii ; *R.I.C.* (1902), xv. 114, O.S. xxix. 13]
 ‘Tokenbury’ [*R.I.C.* (1902), xv. 114, O.S. xxviii. 7]
- ST. KEVERNE.—On Goonhilly Downs [O.S. lxxxii. 13]. There is a small camp close to this
 At Halwyn near Porthalla [*Polwhele*, 125, O.S. lxxxii. 3]
 Thomas marks traces of another near Athay

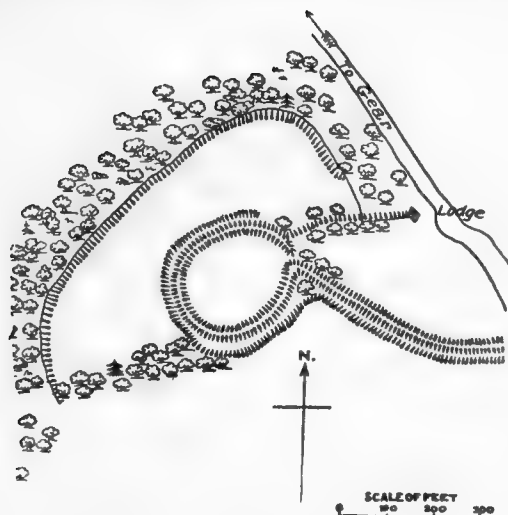


A HISTORY OF CORNWALL

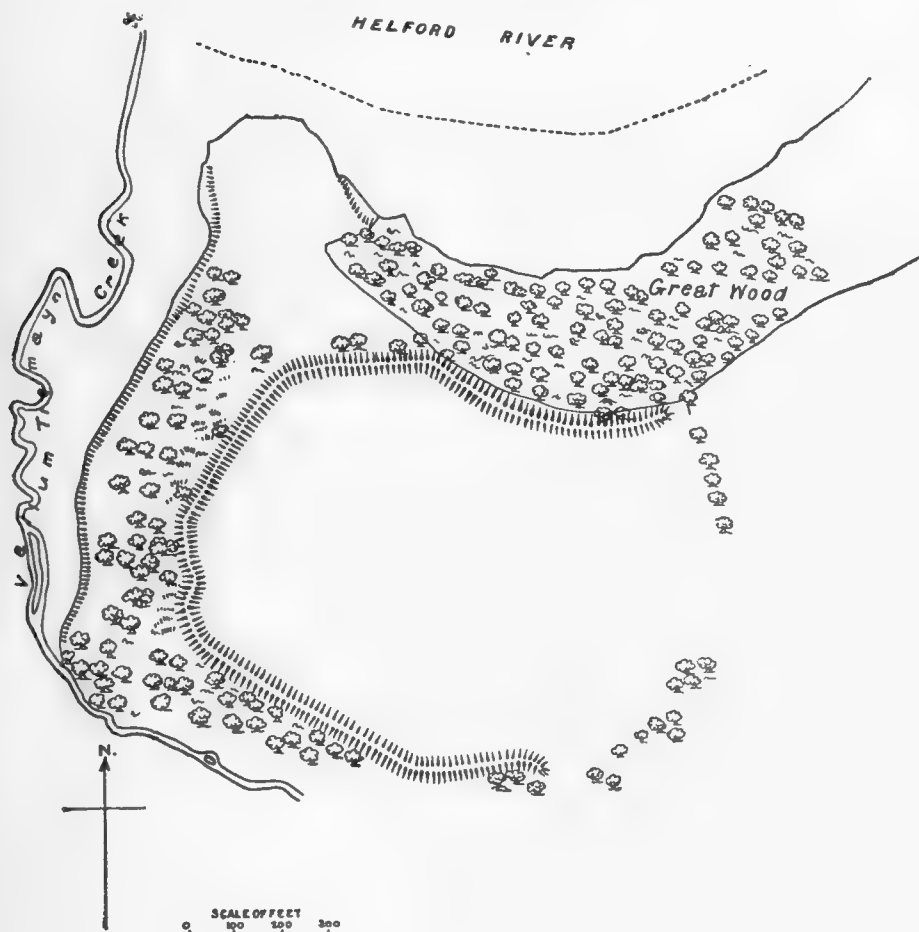
- ST. KEW.—At Tregilders [*R.I.C.* (1890), x. 231, O.S. xxv. 4]
 At Trevinnick [*R.I.C.* (1890), x. 229; *R.I.C.* (1902), xv. 111, O.S. xix. 7].
 These two are classed as Roman in Mr. Iago's scheme [*Maclean*, ii. 80]
 At Polrode [*R.I.C.* (1902), xv. 111, O.S. xx. 5]
- ST. MARTIN IN MENEAGE.—'The Gear' [*Pol.* 125; *Drew*, ii. 451; *Daniel*, 198, O.S. lxxvi. 16]
 At Caervallack [*Drew*, ii. 451; *Daniel*, 198, O.S. lxxvi. 16]
 At Tremaine [O.S. lxxvii. 13]
- ST. MEWAN.—Near Trelower [*R.I.C.* 29th Rep. (1847), p. 31 and plan, O.S. l. 15]
- ST. MINVER.—At Dinham. There is no trace of a camp here, but *Polwhele* (p. 108) says:
 'We observe in the parish of St. Minver a Roman camp on a little tongue of land washed
 by the Camel. It is called the Dinas.' The identification is hypothetical, and see
Maclean, iii. 7
- ST. NEOT.—At Goonzion Down [O.S. xxxv. 2]
- ST. STEPHEN IN BRANNEL.—Near Langerth [Nanzearth, O.S. l. 6]
- ST. TEATH.—Near Castle Goff. See Lanteglos
- ST. WENN.—At Demelza [*Pol.* bk. i. ch. xi. p. 210, O.S. xxxiii. 10]
- SANCREED.—At Trannack Downs [*Thomas*]
- SITHNEY.—St. Elvans, now a small field, roughly circular with a ditch on the north side, called
 the 'Garland' (Caer-Lan?). There is a local tradition that it was once a graveyard. It
 is the property of the churchwardens [O.S. lxxvi. 9]
- SOUTH PETHERWIN.—'Battle Ring,' at Brockle [*R.I.C.* (1902), xv. 113, O.S. xvi. 16]
- STOKE CLIMSLAND.—On Kit Hill. This earthwork is of a different character, and perhaps
 origin, from the types of the class. It is however included here until digging, or some
 other source of information, afford more reliable knowledge. It is the site of a legendary
 battle [O.S. xxix. 7]
- STRATTON.—At Binnomay. Stated by Dr. Borlase and Polwhele to be a Roman camp. But
 certainly the site of a later building, as William of Worcester says that 'Castle Bynamy'
 was standing in his time, and was the property of Sir John Colshill or Colville [*W. of*
Worcester; *Borlase*, 312; *Pol.* 107; *Lysons*, ccxlvii; *R.I.C.* 34th Rep. (1852), p. 20
 and plan, O.S. v. 4]
 'The Castle,' half-mile north by east of Stratton. Not marked in ordnance map
 [*R.I.C.* 34th Rep. (1852), p. 21 and plan]
 'Yerdbury,' at Hunthill [*Lysons*, ccxlvii. (and ? Grews Hill); *R.I.C.* 34th Rep.
 (1852), p. 21 and plan (as Hardbury); (1902), xv. 113, O.S. iv. 9]
- TALLAND.—At Bury Park, Trelaske near Kilminorth [*Gilbert*; *Bond*, 165; *R.I.C.* 28th
 Rep. (1846), p. 27 and plan]
- TINTAGEL.—'Trenalebury Ring' [*R.I.C.* (1902), xv. 111; *Maclean*, iii. 189, O.S. x. 14]
- VERYAN.—Near Trengrowse, Castle Ends [O.S. lxvi. 1]
 Near Gwendra; south of Church Town [Carne, O.S. lxv. 12]
- WEEK ST. MARY.—'Ashbury' [*Lysons*, ccxlvii; *R.I.C.* (1890), x. 233; (1902), xv. 113,
 [O.S. viii. 8]
 At Swanacot " " " " " "
 [O.S. ix. 1]
 At Church Town [*R.I.C.* (1902), xv. 113; *Daniel*, 137, O.S. viii. 8]
- WENDRON.—At Grumbla, 1½ miles north-west of Gweek [O.S. lxxvi. 7]
- WHITSTONE.—At Hilton Wood [*Lysons*, ccxlvii; *R.I.C.* (1902), xv. 112, O.S. vi. 13]
 'Froxston Castle' " " " " " 113

PROBABLE ROMAN CAMPS

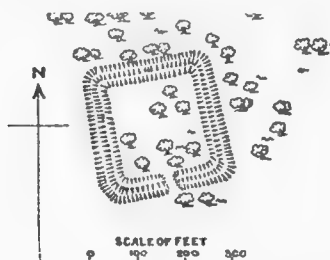
- BODMIN.—'Tregear' at Nanstallon. No systematic investigation has been made, but various
 objects, many of them of undoubted Roman origin, have been found here from time to
 time. A full list and description are given in *R.I.C.* (1890), x. 211, etc. The camp
 is square-sided with rounded corners. It lies low near the river, and is completely
 overlooked by Dunmere Woods (see Bodmin *Sup.*) [*Daniel*, 143; *R.I.C.* 31st Rep.
 (1849), p. 21 and plan; *Maclean*, i. 114 and plan]
- ST. EARTH.—At Bosence. No systematic search has been made. In 1756 the farmer found
 and cleared out a pit 36 feet deep in the west corner, in which a bowl with an inscription
 on the bottom, a jug and other articles, probably Roman, were found. Dr. Borlase



ST. MARTIN IN MENEAGE, CAERVALLACK.



ST. MARTIN IN MENEAGE, TREMAINE.



WENDRON, GRUMBLA.

DEFENSIVE EARTHWORKS, LIST III., DIVISION II.

A HISTORY OF CORNWALL

described the bowl and jug as made of tin, but they are of pewter and lead respectively. A full account with a plan of the camp is given by Dr. Borlase in the *Antiquities of Cornwall*, p. 316, and for a further description and interpretation of the inscription see *R.I.C.* (1890), x. 237, etc. This camp is also square-sided with rounded corners, and is overlooked by Pencair Castle (see Breage, List II.). It is now nearly obliterated [*Borlase*, 316 and plan; *Lysons*, ccxlvii.; *Gilbert*; *R.I.C.* 29th Rep. (1847), p. 39 and plan, O.S. lxix. 14]

LIST IV

OTHER EARTHWORKS

BRADDOCK AT TAPHOUSE.—Dr. Borlase in searching for traces of a Roman road between Lostwithiel and Liskeard records the existence in his day of a long mound at this point which he concluded was a successful result of his inquiry. He mentions a similar mound between Lostwithiel and Golant. Little or no trace of either now remains [*Borlase*, 333, O.S. xxxv. 10]

LANREATH.—‘Giants Hedge.’ A great mound of earth formerly extended from the river at West Looe to the upper waters of Lerrin Creek on the Fowey a distance of nearly eight miles as the crow flies. It has been destroyed in several places, but is still clearly traceable in the parishes of Lanreath and Pelynt. Dr. Borlase and Polwhele consider it was a Roman road. No other suggestion as to its origin has been put forward unless we admit the local saying :

The devil one day having nothing to do,
Built a great hedge from Lerrin to Looe

[*Borlase*, *Nat. Hist.* 325; *Polwhele*, 80; *Couch*, 79; *Gilbert*, sub Talland; *R.I.C.* 28th Rep. (1846), 19; *Lysons*, ccxlvii.]

ST. AGNES AT GOONVREA.—St. Agnes Beacon is a steep lonely hill, 629 feet high, near the cliff, north-east of Redruth. On either side a narrow valley cuts into the land. On the land side of the hill a trench and mound run from one valley to the other, a distance of about two miles. The enclosed space is nearly two square miles. This trench was formerly called the ‘Kledh.’ It has many features in common with the majority of the cliff castles, but its enormous comparative size places it by itself, pending more information. Borlase and Polwhele both considered it a Roman defensive work against an enemy landing on the cliffs under the beacon, the one suggesting Danes, the other Irish. It is much damaged by building and mining works, but can still be traced in many parts. Locally it is considered to be the work of Giant Bolster [*Borlase*, 314; *Lysons*, ccxlvii.; *R.I.C.* 29th Rep. (1847), p. 28; *Pol.* bk. i. ch. xi. p. 205]

LIST V

PLANE-AN-GWARIOW

GWENNAP.—Gwennap Pit. It is doubtful if this place was ever used for plays. John Wesley preached here, and it has since been used almost exclusively for that purpose. It is not marked in the ordnance map [*Gilbert*; *Daniel*, 194]

LANDEWEDNACK.—Near the church. Not marked in the ordnance map and not traceable. Inserted on the authority of *Polwhele*, bk. ii. ch. iv. p. 192. Polwhele was vicar of Manaccan in this neighbourhood

NEWLYN EAST.—About $\frac{1}{4}$ of a mile north of Church Town on west side of the road; modern

PERRANZABULOE.—‘Perran Round.’ This was used for plays and sports, but may have had an earlier origin. The plan in Dr. Borlase’s *Natural History* shows a most noticeable foss outside [*Borlase*, *Nat. Hist.* 298 (with plan); *Polwhele*, bk. ii. ch. iv. p. 192; *Gilbert*; *Drew*, ii. 542; *Daniel*, 186, O.S. xlviii. 6]

REDRUTH.—Part of the north end of the town is still called Plane-an-Gwarry. The place is marked in Martin’s map of Cornwall, 1759 [*Tonkin*; *Polwhele*, bk. ii. ch. iv. p. 192; *Gilbert*; *Daniel*, 204, O.S. lxiii. 3]

RUAN MAJOR near the church } Both included on the authority of *Polwhele*, bk. ii. ch. iv.
RUAN MINOR at Trealeage } p. 192

ANCIENT EARTHWORKS

ST. COLUMB MAJOR.—A little south of the main road at Indian Queens; modern

ST. JUST IN PENWITH.—In the market place. The wall facing which now protects the Round on the outside was built about forty years ago. This is still called locally the 'Plane-an-Gwarry,' or short, 'The Plane' [*Borlase*, 208 (with plan); *Polwhele*, bk. ii. ch. iv. p. 193; *Buller*; *Daniel*, 218, O.S. lxxiii. 2]

SITHNEY.—Plane-an-Gwarry [O.S. lxxv. 5]. There is a tenement so called about $\frac{1}{2}$ mile east of Church Town, but nothing now existing to mark the actual site. There is a shallow circular depression in a field here which is identified on the ordnance survey, but this is not in the field known as the 'Playne Field'

MARITIME HISTORY

Hitherto France and Spain have been the only two powers that have threatened an invasion of England from the south ; and Cornwall, being the nearest to Spain and opposite the great military ports of Brittany and the Bay of Biscay, was thought to be peculiarly exposed to danger. As a fact, it has never experienced anything more serious than inconsiderable raids, and that portion—the Scilly Islands—which for two centuries Cornish men were constantly representing to the Government as especially subject to assault and especially attractive to an enemy, has never been attacked at all since the Viking era. These islands, although extremely dangerous of approach, often shrouded in sea fog, with an anchorage exposed to the full force of the frequent westerly gales, and, at least in former days, unable to supply a fleet with water or provisions, might possibly have served as a temporary base for an enemy who had obtained the command of the Channel and was bent on destroying commerce. But, of old, an enemy having obtained such command would have used it for a purpose more important than commerce destruction, and the Scillies are useless for invasion. The tactical value of the islands has never been tested, because no modern enemy has ever held the command of the Channel long enough to make use of them ; but it is obvious that their safety, like that of the Channel Islands, depends not on the forts and garrisons for which successive governors pleaded, but on sea power, and that their possession stands or falls with the supremacy of the British Navy.

No part of the mainland of Cornwall can be described as offering particular facilities for invasion, but nature has marked out sharply between the north and south coasts the divergence from mere peril to infinite risk. From the sea mark on St. Martin's Island, Scilly, to the north-west extremity of Cornwall is a stretch of some 85 miles of reefs, sands, and foul and rocky cliff : grim and forbidding under the most favourable conditions ; almost certain destruction when, as frequently happens, it is a lee shore in gales from west round to north-east. In this length of coast there are only two harbours : St. Ives, dangerous in winds from north to east, and Padstow, difficult or even hazardous of entrance, while neither affords shelter for any craft much bigger than a coaster.¹ It is therefore not surprising that we do not hear of the appearance of an enemy on this coast except in the shape of an occasional privateer. The southern seaboard has proved sufficiently fatal to mariners, but compared with that of the north it offers spacious bays, sheltered anchorages, and safe harbours, of which the best—Falmouth—seemed at one moment likely to become the chief military and commercial port of the west. There are no statistics available, but it is not unlikely that half the wrecks that occurred in early times on the southern shores of Cornwall were due directly or indirectly to the Lizard, and the reputation of the promontory has affected the whole coast ; but the Lizard itself has been the salvation of vessels caught under certain conditions of wind and situation. On the whole, however, we have a county rock-bound and studded with reefs, projecting into the English Channel in such a direction as to form a trap for vessels driving down before easterly gales, or entering, whether from the south or north, before westerly ones, and with the jagged mass of the Lizard jutting out as the tongue of the trap to ensure destruction. In the middle ages such a coast, uncharted and unlighted, was safe enough from attack for eight months out of the year, for it requires little imagination to picture the reflections of the foreign seaman who found himself off it on a black winter night or approaching it during the short and dark winter day.

From the point of view of the invader the ports that would tempt him afford compensating advantages to the defender. Falmouth could shelter an invader's fleet, but many thousands of men and many batteries in outlying positions would be necessary to protect the Carrack Roads from the defender's attack. Fowey could have received the fleet of a mediaeval invader, but there also the same network of outlying positions would be required, though on a smaller scale. But the great disadvantage of the county from the invader's standpoint is the distance from any vital centre to which he must force his way before commencing decisive operations ; while the rugged character of the interior, offering the defender excellent military positions, would make his advance slow and costly. Moreover, the invader of Cornwall would have had great difficulties of transport to reckon with, for the county was probably one of the most backward in England in the construction of roads for wheeled carriages.

¹ In the twenty-four years 1823-46 there were 131 vessels lost between the Land's End and Trevose Head, a distance of little more than 40 miles (*Parl. Papers*, 1859, x, pt. i, 331). Of course steam has largely diminished these risks.

A HISTORY OF CORNWALL

As the early inhabitants of Cornwall and Devon are described as having intercourse with Gaul and as having been more civilized than the other tribes of the south coast, we may suppose that in maritime matters they had advanced beyond the simple coast fishery which is the first step towards navigation. This inference is supported by Caesar's statement that the Veneti were assisted by British ships, and these must have crossed the Channel to the Bay of Biscay to join their allies. On the other hand, in that stage of social development there was no room for two maritime nations of equal strength to live in peace within striking distance of each other, and we may be certain that the ships belonging to the south-western coasts were not in number or size of a kind to cause the Veneti jealousy or fear, nor is there any statement that local shipping was employed in the transport of tin. The Romans are said to have adopted a long, low, fast-sailing boat in use among the Britons, and this, no doubt, belonged to the south coast. Some antiquaries believe that there is evidence indicating the existence of Roman naval stations at Polruan, on the Fal, and at Condurra, but it is not sufficient to outweigh the antecedent improbability. The long struggle of the Saxon conquest and settlement did not affect Cornwall in any way that has procured notice in maritime annals before the subjection of the West Welsh in the campaigns undertaken by Egberht. The Danes settled in Ireland soon found their way across the sea, and their alliance with the natives and the battle of Hengston in 837 imply many previous leagues on a smaller scale between the Cornish and the raiders, who could have found little to tempt them in Cornwall compared with the richer country farther east.¹ It is possible that the West Welsh not only supplied recruits to the Viking armies, but themselves harried the neighbouring coasts in their own vessels; and this may have been one factor impelling Æthelstan to his march to the Land's End in 925, since which Cornwall has been an integral part of the kingdom.

No doubt for nearly a thousand years the men of the coast had carried on an unambitious maritime business, principally in the fishery, perhaps trafficking with their kindred in Brittany, who probably then visited Cornish waters for fishing purposes, as they did in later centuries. Perhaps, too, Cornish ships ventured as far as the ports of Guienne, and such vessels may have formed a portion of the fleets levied by the later English and Danish kings before the Conquest. For some years after 1066 William I had no fleet, but when the necessity arose he found no difficulty in raising one from his English and Norman territories, and between the last threat of a Danish invasion in 1083 and the loss of Normandy in 1204 there were few occasions for great maritime levies, seeing that the Channel then was not a disputed tract, but only the sea road between dominions under the same sovereign. In 1171, at Milford Haven, there were collected 400 vessels to carry Henry II and his army to Ireland, and from geographical situation it is certain that Cornwall must have furnished its quota to the expedition. But for upwards of a century only small fleets for transport purposes were required in the desultory dynastic wars occurring, and for these it was sufficient to call upon the Cinque Ports, London, and the adjacent districts; the king's writ ran in the west, but it was cheaper and quicker to levy in the centre of maritime traffic, where ships were larger, men more numerous, and there would be less delay. A fleet conveying the main body of the Crusaders left Dartmouth in April, 1190, but most of the vessels were obtained from the Continental possessions of the crown.

With the reign of John we have the first official reference to the maritime life of Cornwall; in 1205 orders were sent to the bailiffs of that and other western counties to procure expert workmen and seamen to build and navigate the king's ships,² and their existence in 1205 imports previous generations of craftsmen who furnished unrecorded services. The Patent and Close Rolls show that the right of impressing ships and men was strictly enforced during this reign, and the 'common form' character of the orders proves that it was no new proceeding. The names of ships and their owners in the various ports were registered by William of Wrotham, the administrative head of the navy, and Cornwall is always included in the writs sent to the counties generally. There is a list of fifty-one galleys belonging to the Crown in 1205, with the ports at which they were stationed, but there is none between Exeter and Bristol. John's wars in Ireland and Wales in 1210 and 1212 necessitated general arrests of ships in those years, but we have no details of the part taken by the several ports nor of the proportions in which they furnished the great fleet of 500 vessels in 1213 which won the victory of the Swin. The naval history of Cornwall during the reign of Henry III is not important, the principal reliance being placed in the Cinque Ports service, which formed the backbone of the royal fleets. In 1224, war with France being expected, there was a general arrest of shipping round the east and south coasts, but it ended at Dartmouth. In 1226 there was an order forbidding ships to sail to French ports, and writs were directed to the bailiffs of Fowey and Falmouth amongst others;³ in 1230 there was another general arrest of all ships capable of carrying sixteen or more horses, for an invasion of Brittany, and this time the

¹ Grimsby and St. Agnes in the Scillies and Helford and Gweek on the mainland are Norse names (Taylor, *Words and Places*), and suggestively well-chosen stations.

² Pat. 6 John, m. 2.

³ Close, 10 Hen. III, m. 27 d.

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writs were directed also to Cornwall.¹ Fowey and Falmouth are the only two Cornish ports as yet referred to ; and at the latter, in 1226, a trading vessel of Bruges was plundered by the crews of four English ships, apparently coasters.²

A feature of the thirteenth century is the appointment of one or more persons, sometimes for one county and sometimes for a group of counties, as keepers of the coast, a step towards organization and systematic defence. In August, 1224, Geoffrey de Lucy was nominated keeper of the whole coast from Pevensey to Bristol, but on 7 September John of Bayeux is entrusted with the keepership of Cornwall and Devon.³ As Lucy was in command of the fleet his superior appointment was no doubt made to qualify him to give orders to the keepers in the various counties. The duties of the keeper were both military and judicial ; but, practically, he was expected to put down piracy, to beat off raiders, to enable coasters and fishermen to sail in peace, and to summon the county to arms on invasion. To do this he could call upon the coast districts to furnish men and ships. The office did not continue long, for during the second half of the fourteenth century the growth of the admiral's court, the increased power of the admirals, and finally the creation of the office of High Admiral, lessened its importance. Historically, however, he seems to be the ancestor of the conservators of truces instituted locally by Henry V, and the latter and more fully developed vice-admirals of the coast we find acting from the middle of the sixteenth century. A part of the system of defence under the care of the keeper was the line of beacons, corresponding to the modern coastguard stations, which encircled the coast, usually placed on the hill nearest to the shore and guarded in war time by a watch from the neighbouring parishes.⁴

The Welsh wars of 1277 and 1282-3 and the Scotch war of 1295 were mainly fought by the feudal armies ; squadrons of ships were present, but the fighting units were chiefly provided by the Cinque Ports, as was usual at this time. Edward himself went to Sluys in 1297, and for this expedition there was a general arrest of ships of 40 tons and upwards along the south coast.⁵ In 1301 and 1302 Cornwall was required to assist in the Scotch war : in the first year Looe and Fowey were called upon to send each one ship ; in the second year Looe, Saltash, and Portpilham⁶ were grouped for one, and Lostwithiel, Bodmin, Fowey, and Polruan for another.⁷ In the case of the 1302 levy security was to be taken from the owners that the ships would actually appear ; for in the previous year several towns, including Fowey, had ignored the king's writ.⁸ Probably shipowners found piracy or privateering more profitable, and Cornish proclivities in this direction had already attracted the king's attention,⁹ but there was no general disinclination to respond to the demands of the crown. The constant levies of ships and men were apparently destructive of commerce, but in reality were not nearly so disastrous to it as they appear. A trading voyage involved great risk of loss from wreck, piracy, and privateering, or in the sale of the cargo ; the royal service meant certain pay for the fitting and hire of the ship, sixpence a day for the officers, and threepence a day for the men—very liberal wages allowing for the different value of money. The incessant embargoes that harassed trade—then much increased—under Edward III were not yet common, and the alacrity with which most of the ports responded to the demands made upon them shows that the assistance required was neither too oppressive nor unwelcome, especially as those who contributed to the sea service were freed from any aid towards that by land. There was no permanent naval organization at this time. The king possessed some ships of his own, and the commanders were usually charged with their maintenance. When a fleet was to be raised from the merchant navy a certain extent of the coast was allotted to one of the king's clerks, or to a serjeant-at-arms, who acted with the bailiffs of the port towns in selecting ships and men and seeing them dispatched to the place of meeting. If a ship did not appear, or the men deserted, they, or the owner, might be required to find security to come before the king ; and, although there was as yet no statute¹⁰ dealing with the offence, they were imprisoned by the authority of the king alone, or punished at the discretion of the admiral.¹¹ In 1306 the steward of Cornwall was ordered to commit to Launceston Castle any mariners who refused to serve at the king's cost ;¹² but Edward usually preferred persuasion to rougher methods, and in 1303 requested the burgesses of Liskeard, Launceston, and Portpira¹³ to aid those of Looe, Portpilham,

¹ Close, 14 Hen. III, m. 17 d.

² Pat. 10 Hen. III, m. 7.

³ Ibid. 8 Hen. III, m. 3, m. 5.

⁴ 'Signa consueta vocata beknes per ignem.' Cf. Southey, *Lives of the Admirals*, i, 360 (quoting Froissart), as to the method of constructing them.

⁵ Pat. 25 Edw. I, pt. ii, m. 10.

⁶ West Looe.

⁷ Pat. 29 Edw. I, m. 20 ; 30 Edw. I, m. 2.

⁸ Ibid. 30 Edw. I, m. 14, m. 10.

⁹ Ibid. 21 Edw. I, m. 14, m. 10 d.

¹⁰ The first statute was 2 Ric. II, stat. i, c. 4, by which deserters were fined double their wages, and imprisoned for a year.

¹¹ Pat. 30 Edw. I, m. 13 ; 32 Edw. I, m. 28 ; Close, 17 Edw. II, m. 6 d. In the case of Fowey, in 1301, the punishment was left to the discretion of the king's clerk sent down (Pat. 30 Edw. I, m. 14).

¹² Ibid. 35 Edw. I, m. 45.

¹³ Polperro.

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and Saltash in equipping a ship, explaining that he set 'special store' on the naval side of the campaign, and that the inhabitants of the three towns assessed could not by themselves suffice for the expenses.¹

The plunder of wreck was, of course, more or less common all round the coast; but in Cornwall lawlessness seems already to have reached an extreme limit, perhaps because it was so far from the seat of government. In 1305 William le Poer, the coroner of the Scilly Islands, went to Tresco to inquire into a wreck, and to take charge of the salvaged cargo; but he was seized and imprisoned by a mob, the ringleader being the prior of St. Nicholas, until he bought his freedom, and subsequent inquiry showed that the men-at-arms and their leader, who garrisoned the islands, were the principal offenders.² Shortly afterwards a Spanish ship was wrecked on the mainland, the cargo plundered, and the owner kept in confinement at Mousehole for a year.³ Another bad case caused a commission of inquiry in 1340; here an Irish ship came ashore at Porthleven, when sixty-one persons named, including several religious, broke up the vessel 'into little pieces,' and carried away timber and cargo.⁴

Smuggling, in the shape of the secret and unlicensed exportation of wool, was another branch of maritime enterprise, and piracy was an ordinary business venture. Many of the cases of so-called piracy, however, were simply seizures of enemies' goods in neutral ships, and would merely have provided legal arguments had an Admiralty Court existed; others can have had no such explanation, such as an instance in 1312 when a ship lying at Fowey was boarded by Fowey and Lostwithiel men, taken away and sold abroad, and the owner held a prisoner at Lostwithiel.⁵

The townsmen of the various ports eventually found the methods of Edward II in unpleasant contrast to those of his father, for they were frequently called upon to supply ships at their own expense. But at first the ordinary course was followed; and a large fleet being fitted out for the Scotch war in 1311, Looe and Fowey were required to send two vessels, for which the cost would be paid in coin at the Exchequer, allowed on the farm of the towns, or deducted from any debt due to the king.⁶ Again, in 1314 the same towns were assessed for two ships;⁷ but by 1316 a depleted exchequer necessitated what must have appeared to be injustice, for two of the king's clerks were sent to the ports between Southampton and Falmouth to take up ships at the expense of the burgesses for the guard of the Channel.⁸ In 1317 Looe and Fowey were ordered to send a ship to serve at their own cost for a month and afterwards at the king's, and in 1319 Looe, Fowey, Bodmin, and Falmouth were desired to send as many ships as they could to serve three or four months at their own expense.⁹ The naval service for the Scotch war had pressed most heavily on the Cinque Ports and the east coast, and the eastern towns must have welcomed a truce, in 1320, for two years. In 1322 the war was renewed, and on 3 April Edward applied to many ports, but in Cornwall only to Falmouth, for ships at their own expense. Apparently there was no ready response to this, for on 25 April the same application was repeated with the proviso that the levies were to be at the cost of the crown, and Fowey and Looe were now included.¹⁰ In 1323 a truce for thirteen years was made with Scotland, but war with France followed immediately, and transports were required for the conveyance of an army to Gascony, for which Fowey sent one vessel.¹¹ A series of embargoes and preparations, attended by little result, succeeded, until the menacing attitude of Isabella in 1326 caused urgent preparations to be made to meet the imminent invasion. Early in the year powerful fleets had been commissioned in the North Sea and in the Channel, but on 12 August an embargo was placed on every ship in England, even fishing boats being detained.¹² In Cornwall the order was directed to Fowey, Polruan, Lostwithiel, Looe, Hayleworthy, Oldestowe (Padstow), Mousehole, St. Michael's Mount, and Falmouth, and we find that Fowey was to send two ships and forty-six men, and Looe four ships and eighty-four men.¹³ As the other ports sent no vessels it may be presumed that they did not possess any of 50 tons, but it is worth noticing that the similar writs to the east coast were for vessels of 30 tons and upwards, which suggests that those belonging to the south coast were of an average higher tonnage.

Foreign war did not prevent civil war between the towns of the southern counties. On 29 January, 1320-1, a writ issued¹⁴ commanding the men of the Cinque Ports not to injure those of Lostwithiel, Fowey, and Polruan, nor to prevent them trading in the Cinque Ports. The quarrel arose from the west-countrymen having taken a man accused of murder—no doubt a

¹ Pat. 31 Edw. I, m. 28.

³ Ibid. 3 Edw. II, m. 17 d.

⁵ Ibid. 4 Edw. II, pt. i, m. 15 d.

⁸ Pat. 9 Edw. II, pt. ii, m. 26.

¹⁰ Close, 15 Edw. II, m. 15 d.

¹² Ibid. 20 Edw. II, m. 11 d. Ships of 50 tons and upwards were called upon for service; those of smaller tonnage were to remain in port.

¹³ Ibid. m. 8.

² Ibid. 33 Edw. I, pt. i, m. 13 d.; 35 Edw. I, m. 46 d.

⁴ Ibid. 14 Edw. III, pt. i, m. 31 d.

⁶ Ibid. m. 7.

⁷ Rot. Scot. 7 Edw. II, m. 6.

⁹ Rot. Scot. 11 Edw. II, m. 17; 12 Edw. II, m. 3.

¹¹ Ibid. 17 Edw. II, m. 9 d, 11 d.

¹⁴ Pat. 14 Edw. II, pt. ii, m. 24.

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Cornishman—out of a Cinque Ports ship, and some of the Portsmen were killed in the affray. As a consequence the Kent and Sussex ports were sending ships to sea to hunt down vessels hailing from the Fowey River. The king's writ did not restore peace, for in the following August another inhibition, following another appeal from the western men to the king, was addressed to the Portsmen,¹ from which it seems that they were then at war with most of the western ports. There is no documentary evidence for the well-known tale told by Leland, and assigned by him to the next reign, of the Fowey men refusing to 'vail bonnet' to the Cinque Portsmen, fighting them off Rye, and earning the name of the 'gallants of Fowey'; but the story as existing in the days of Henry VIII may be a distortion by tradition of these facts.

A short war with Scotland in 1327-8 hardly affected the south of England, but a more serious one broke out in 1332; and in 1333 and 1334 there were orders to prepare all the ships available, in both cases addressed only to Falmouth.² The continual embargoes and consequent injury to trade were now causing some murmurs in the port towns, but Edward knew when to persuade rather than to command, and in December, 1336, sent officials round the coast to explain 'certain things near the king's heart.'³ At the same time the maritime towns were requested to send representatives to London to discuss matters, and burgesses came from Falmouth, Fowey, Polruan, Looe, and Padstow,⁴ when, no doubt, social and other influences were brought to bear upon them. In the following January there was a general arrest of shipping,⁵ in which Fowey, Polruan, Truro, Looe, Lostwithiel, and Bodmin took part. A catalogue of the orders which rapidly succeeded each other during this reign for arrests of ships in the various ports would be barren of interest unless the connexion with general history was shown. In 1338 and 1339, when France had joined the Scots, the balance of maritime war was against England, until the victory of Sluys restored our supremacy for many years. Several disasters occurred to towns on the south coast, but Cornwall lay outside the raiding field, and perhaps did not promise much booty. But there are indications that the Cornishmen were active enough themselves when there was a chance of legal or illegal profit. In 1343 a great 'tarot' put into Dartmouth, and was at once plundered by Cornish and Devon men, 'to the shame and scandal of the whole realm.'⁶ In 1342 the duchess of Brittany took some Cornish privateers into her service, who used their opportunity by drawing no distinction between friends and enemies, and in fact, joining with kindred spirits, seem to have formed pirate fleets, 'confederating together in divers ships of war.'⁷

By 1340 the continuous strain was telling upon the English reserve of shipping, and the sheriffs of the maritime counties were ordered to prevent any sales to foreigners;⁸ but apparently this was not sufficient, and in 1341 a council was convened at Westminster to advise upon that and other subjects. The more important seaports each sent two delegates; the others, including Falmouth and Fowey for Cornwall, one each.⁹ The plan may have been found successful in flattering the shipowners,¹⁰ and it was repeated in 1342, 1344, and 1347. In 1342 Fowey and Polruan sent one delegate and Looe one, in 1344 Falmouth alone sent one, and in 1347 there was no representative from Cornwall.

There was a commercial as well as a military side to the maritime history of the county. Padstow is reputed to have been a passage port for Ireland. Fowey was a passage port, and there was evidently a wool trade, sometimes an arrival of a Spanish or Italian trading vessel, and a general export trade in dried fish to Bordeaux existed.¹¹

In 1339 the French were raiding the south coast, and came as close as Plymouth; they were expected in Cornwall, and in March a commission of array mustered all the men between Saltash and Mousehole for the defence of the county.¹² The urgent necessity for ships may have caused Sir William Trussell, the admiral of the western fleet, to exceed his powers in demanding four from Bodmin, and in imprisoning the mayor and others at Lostwithiel for their refusal. A petition to the crown, and consequent inquisition, showed that Bodmin was not a port, had never found ships, and that the burgesses had nothing to do with maritime trade, except that four of them were in

¹ Close, 15 Edw. II, m. 32 d, 31 d.

² Rot. Scot. 7 Edw. III, m. 17 d.; 8 Edw. III, m. 3. A customs writ of 1324 (Pat. 17 Edw. II, pt. ii, m. 2) shows that Fowey and Lostwithiel were then 'members,' in customs terminology, of Falmouth; therefore maritime writs to Falmouth may also have included Fowey.

³ Close, 10 Edw. III, m. 4 d.

⁴ Rot. Scot. 10 Edw. III, m. 3 d.

⁵ Ibid. m. 2.

⁶ Pat. 16 Edw. III, pt. iii, m. 1 d.; 17 Edw. III, pt. i, m. 34 d.

⁷ Pat. 16 Edw. III, pt. i, m. 11 d.

⁸ Rymer, *Foedera*, v, 210.

⁹ Ibid. 231.

¹⁰ 'Avisamentum et consilium marinariorum et hominum maritimorum,' says the writ (Close, 16 Edw. III, pt. i, m. 23 d.). They received 2s. a day for their expenses (Ibid. 18 Edw. III, pt. i, m. 18 d.).

¹¹ Malvegin, *Hist. du Commerce de Bordeaux*, i, 177; Close, 12 Edw. III, pt. i, m. 40 d.; *Foedera* (ed. 1816), iii, 191, 472, 479; Rot. Fr. 21 Edw. III, pt. i, m. 1. In the last, the 'Langeshippes' are mentioned (1347). The Raynoldis Stone (Runnelstone) occurs in some sailing directions of the reign of Edward IV.

¹² Pat. 13 Edw. III, pt. i, m. 28 d.

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partnership with a Lostwithiel man in one ship.¹ Early in 1340 the western ports promised to provide seventy ships of 100 tons and upwards, as far as possible at their own cost,² to join the royal fleet, and no doubt many of these ships helped to win the great victory of Sluys in the following June. In 1342 complications arose in Brittany owing to the death of the duke without direct heirs, leading to the dispatch of a large fleet and army under Sir Walter de Mauny; Edward himself crossed later in the year. In one fleet alone there were 357 vessels, of which Looe sent five and Fowey three ships.³ An undated list, probably relating to another fleet prepared for this expedition, gives a total of 119 vessels, towards which Saltash sent two barges and Looe one; Fowey, Polruan, and Lostwithiel, six ships and a barge; Falmouth, two ships and a barge; and Padstow, one barge. A comparison of this list with the corresponding one for Devon (*Mar. Hist. of Devon*) will show how far behind in maritime importance the neighbouring county had already left Cornwall. After Edward's arrival many of the vessels deserted from Brest, leaving the king and his troops 'in very great peril,' and writs were directed to the bailiffs of the ports to arrest the deserters and seize their property. The masters of six ships of Looe, eight of Fowey, five of Polruan, and one of Falmouth are named; the ships and goods were to be forfeited, and the masters and mariners fined.⁴ For the campaign of Crecy and the siege of Calais a huge armament was collected—from 1,000 to 1,600 sail, say the chroniclers. According to the *Roll of Calais*, which purports to be a copy of a Wardrobe account, Looe sent 20 ships and 325 men; Fowey, 47 ships and 770 men; Padstow, 2 ships and 27 men; and Polruan, 1 ship and 60 men.⁵ These figures, however, are very doubtful. There is no contemporary record, all the copies being of the sixteenth century. They do not agree among themselves; besides minor discrepancies, one MS.⁶ gives Fowey only 370 and Looe 203 men, another gives Padstow sixty men.⁷ There are certainly blunders relating to other towns in these copies, and we cannot ignore the fact that Fowey, hitherto treated as a third-rate or fourth-rate port, is suddenly found to have more naval strength available than London, Dartmouth, Plymouth, Bristol, Hull, Newcastle, Ipswich, or any of the Cinque Ports. To the naval historian the pretension is an impossible one, especially as it is not even based on an original record. Whatever the true figures may be, a possible explanation of them is that Fowey and Looe were places of assembly for the naval levies of the county. Such districts as Mount's Bay, towns like Penryn, Truro, and Saltash, and the fishing villages of Mevagissey Bay, must have been represented in the fleet, although they do not appear in the lists, and the 1,200 or 1,600 sail did not include fishing boats.⁸ There is another test that can be applied. The poll-tax returns of 1377⁹ show that there were 269 persons, male and female, above fourteen years of age in East and West Looe. Assuming that the two Looes had not recovered at all in nearly twenty years from the devastation of the Black Death, and that they contained twice as many people in 1347, they still could not have produced 203 able-bodied seamen, far less 325, out of a population of 538, males and females, of all classes, occupations, and ages, above fourteen years; while although to make the Cornish argument stronger West Looe is included, there is no mention of it in the *Calais Roll*. Unfortunately, the returns for Fowey have disappeared, but there is little doubt that they would have led to the same conclusion, and it should be remembered that in 1326, only twenty-one years previously, when every ship available was being brought forward, Fowey was only asked for two ships and forty-six men, being half as many as Looe.¹⁰ The handwriting of the five copies of the *Calais Roll* is of the period 1575–1630, and they offer internal evidence that when the original record was transcribed it was in some places nearly or quite illegible.

The naval history of Edward III is an illustration of the almost invariable consequence, in former times, of the destruction of an enemy's military fleets in causing an increase of raids and privateering. Although sea victories were won, and no resistance was or could be made to the transport of Edward's armies, the coasts were continually harassed by French incursions or the fear of them, and the sense of helplessness was increased by the losses suffered from privateers and the exhaustion of the ship-owning classes. An unstable peace existed between 1360 and 1369, and

¹ Close, 13 Edw. III, pt. ii, m. 11. The prisoners were set free and the ship impressed. We have seen that Bodmin had been treated as a port as recently as 1337 (*Rot. Scot.* 10 Edw. III, m. 2).

² *Rot. Parl.* ii, 108.

³ *Chanc. Misc.* $\frac{ii}{88}$; $\frac{ii}{48}$.

⁴ *Pat.* 17 Edw. III, pt. i, m. 17 d.; Close, 17 Edw. III, pt. i, m. 4 d., 3 d. One Falmouth and three Looe ships did not appear at all. It is very doubtful whether the severe penalties of the thirteenth and fourteenth centuries were often enforced. In some cases they certainly were not, the shipping interest being too important to offend.

⁵ *Cott. MS.* Titus F. iii, f. 262; *Stowe MS.* 570, f. 222; 574, f. 28; *Harl. MS.* 3,968, f. 130; *ibid.* 246.

⁶ *Stowe MS.* 570.

⁷ *Ibid.* 574.

⁸ *Rot. Fr.* 20 Edw. III, pt. i, m. 36, m. 32 (8, 18 March, 1345–6). To arrest all vessels that could be of use for the transport of troops and stores, even of ten or twelve tons, fishing boats excepted.

⁹ *Journ. of Roy. Inst. of Cornwall*, iv, 27.

¹⁰ Compare also the far greater number of ships sent by the Devon ports in 1342.

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the outbreak of war in the latter year caused another council of provincial experts to be convoked at Westminster in November, at which only Fowey, of the Cornish ports, was represented.¹ By this time Fowey ranked as a recognized port, and proclamations of peace or truce, and interdicts on the conveyance of passengers and export of gold and silver, were published there as a matter of routine, just as at Bristol, Ipswich, and other of the great ports; sometimes Falmouth, Lostwithiel, Polruan, Truro, Padstow, Penryn, and Mousehole are named as well.² The renewal of the war was attended by the complete loss of English supremacy in the Channel. Levy followed levy without result; the Commons laid the causes to which they attributed the decay of shipping before the king,³ and in June, 1372, after the defeat of the earl of Pembroke off Rochelle, the crown was reduced to issuing commissions of array for the maritime counties instead of defending them at sea. The ordinary rate of hire was 3s. 4d. a ton for three months, and now both that and wages were left unpaid, in contrast to the liberality Edward had shown thirty years earlier, when he could afford to make extra and unusual payments to help the equipments of the fleets. The year 1375 was marked by another maritime disaster, in the shape of the capture or destruction of thirty-nine merchantmen, ranging from 300 tons downwards, in Bourneuf Bay; but Cornwall escaped with the loss of the *Trinity* of Fowey, of 50 tons, nearly the smallest of the convoy. Edward III died in June, 1377, and in July the French were raiding the southern counties at their will, but as usual stopped short of Cornwall. A writ ordered two barges, two balingers, and 120 men to be impressed in the ports of Devon and Cornwall,⁴ but the English fleet was practically non-existent, and the dire necessity caused Parliament in November to propose that many of the towns should provide balingers by the following March. In 1378 came the turn of Cornwall, for in the summer the Spanish cruisers ranged along the coast, burning Fowey and other places,⁵ and the people petitioned Parliament, complaining that the sailors who should have protected them having been pressed for the king's fleets their shipping and dwellings had in consequence been burnt, many persons put to ransom, and that the Spaniards had threatened to come back and take permanent possession the next summer.⁶ Misfortune followed on misfortune, and in 1380 all that could be done was to require landowners to remain on their estates near the sea to organize defence.⁷ In the same year, however, a fleet from the western ports executed one successful stroke in pursuing a Spanish fleet into Kinsale, defeating it, and recapturing the prizes taken by the Spaniards. Notwithstanding the bitter and repeated complaints of Parliaments about the ruin of English shipping, there are indications that it was organization and generalship that was lacking rather than either men or ships. Confining our attention to Cornwall, we find that in one arrest Fowey supplied ten vessels, of which one was of 120 tons, two of 100, and one of 80 tons.⁸ Again, when the duke of Lancaster sailed in 1385 to obtain possession of his kingdom of Castile, Fowey sent four ships, of which three were of 100 tons each, and Fowey was by no means the most flourishing of the western ports represented.

Hostilities with France ceased in 1389, and for some years maritime commerce suffered only its normal afflictions, for although official peace existed private war always continued. No declaration of war came from either side during the reign of Henry IV, but conditions at sea differed nothing from actual belligerency. In consequence of this state of things, not only the ports but many of the inland towns were ordered, on 11 January, 1400-1, to build and equip ships, singly or in combination, at their own cost, by the following April, Padstow and Lavantstye being called upon for one balinger, Looe and Falmouth for one, and Fowey for a barge.⁹ During these years, while Parliament was complaining of foreign pirates, the French chroniclers say that English seamen were incessantly ravaging the French coast, and both Flemings and Castilians accused Cornish and Devon men of flagrant piracy.¹⁰ In the twenty-eight years between 1343 and 1371 the Fowey owners could only name four of their ships taken by Flemings,¹¹ so that their transactions had not as yet proved unprofitable. It was perhaps the leading part taken by the men of the western counties in these spoliations that led to a special onslaught upon them in 1405. It had been intended that forty ships and three galleys belonging to Castile should have joined a French squadron, but in the event only the three Spanish and two French galleys, under the command of Don Pedro Niño and

¹ Rymer, *Foedera* (ed. 1816), iii, 880.

² *Ibid.* pp. 495, 506, 615, 728, 748, 818, 953, 1068.

³ Pat. 1 Ric. II, pt. i, m. 20.

⁴ *Rot. Parl.* iii, 42.

⁵ Pat. 8 April, 1380.

⁶ *Rot. Parl.* ii, 306, 311.

⁷ Walsingham, *Hist. Anglicana* (Rolls Ser.), i, 374.

⁸ Exch. Accts. K. R. 43.

⁹ *Foedera*, viii, 172.

¹⁰ Parliament met on 20 January, and protested against the proceeding. Henry's position was too uncertain to allow him to insist on the strict legality of his action, and the order was withdrawn.

¹¹ Mark Mixtan of Fowey is named as one of the culprits (Close, 4 Hen. IV, m. 30), but he had also been employed as commander of a squadron acting for the king (Pat. 3 Hen. IV, pt. ii, m. 7 d.). At this time there was a *George* of Fowey, of 200 tons (*Ibid.* 4 Hen. IV, pt. i, m. 28 d.).

¹² Dipl. Doc. Exch. Tr. of Receipt 1271 One ship was of 200 and another of 140 tons.

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Charles de Savoisi, appeared off Looe in August.¹ After sinking nineteen fishing boats and drowning the crews, they landed and attacked the town, and as it was unfortified succeeded in sacking and burning it after such defence as the inhabitants could make.² They then dropped down to Falmouth,³ perhaps intending for Penryn or Truro, but, the coast now being up in arms, worked back to 'Plamua.' Whether 'Plamua' is Plymouth or Saltash must remain doubtful; Mr. Wylie, following a French chronicler, believes it to have been Saltash, but the story in *La Victorial* seems more apposite to Plymouth. Whichever it may have been the attack completely failed, and the squadron left Cornish waters. If they went from Looe to Falmouth, it will be observed that on both courses they passed Fowey without approach, which is significant of its reputation, for it is doubtful whether at this time it was fortified.⁴

To crush privateering and piracy Henry V in 1414 instituted officials in every port, called conservators of truces, who, assisted by two legal assessors, and holding their authority from the High Admiral, were to have power of inquiry and punishment concerning all guilty of illegal proceedings at sea. They were to keep a register of the ships and seamen belonging to each port, and acted as adjudicators in such cases as did not go before the Admiralty Court.⁵ They seem, so far as related to judicial functions, to have been a link on the civil side between the earlier keepers of the coast and the vice-admirals of the coast we shall meet in the sixteenth century. That the statute was strictly enforced, and helped to keep a little peace at sea, is shown by the fact that two years later the king consented to some modification of its stringency by promising to issue letters of marque when equitable. In 1435 it was entirely suspended, being found 'so rigorous and grievous,' said the Commons, taking advantage of a weak rule; in 1451 it was brought into force again for a short time, and once more renewed by Edward IV.

Henry V began his reign with the intention of having a great fleet of his own. The custom of general impressment was now expensive both to the shipowner and the crown, slow and inefficient, and the continual complaints of the merchant class, as voiced in Parliament, were not to be neglected. The system could not be, and was not, at once abolished, but it became much less frequent during the fifteenth century, and there is quite a modern note in the establishment of cruisers along the coast in 1415, although Plymouth was the most westerly station. The great fleet of upwards of 1,400 vessels required for the campaign of Agincourt included a contingent from Cornwall,⁶ but very many were hired in Holland and Zealand, the resources of the kingdom being insufficient or Henry resolved not to tax them unduly. Another great fleet was collected for the campaign of 1417, but out of 217 vessels of which we have details 117 belonged to Holland and Zealand.⁷ Many of the English ports were unrepresented, and it may be surmised that for political reasons the king found it preferable to hire foreign ships as transports rather than to disturb English trade. For this service, however, Saltash sent one ship. An important branch of English maritime traffic in the fifteenth century was the transport of pilgrims to enable them to perform their devotions at the shrine of St. James of Compostella. They could only be carried in licensed ships, and nobles and merchants seem to have been equally eager to obtain a share in what must have been a profitable trade. Most of the ships belonged to the southern ports, and Penzance, St. Michael's Mount, Looe, Fowey, Falmouth, Saltash, and Landulph had their share, one of the ships, the *Mary* of Fowey, being of 140 tons.⁸ As early as January, 1393-4, a licence was obtained for the *George* of Fowey to carry 80 pilgrims, and there were several other Cornish vessels similarly occupied about the same time. The growth of commerce and the consequent necessity for improved accommodation is indicated by a petition in 1427 from William Morton, of St. Michael's Mount, showing that between 'le Forlond of Lysard' and the Land's End there was no secure harbour for vessels of comparatively large tonnage, whereby many were lost, and that he had commenced building a stone pier in Mount's Bay capable of sheltering 200 ships of any tonnage, but desired the king's help. With the consent of Parliament the king granted to Morton, for seven years, dues ranging from fourpence for vessels of 60 tons and under to one shilling for those of 120 tons and upwards, and one shilling yearly from 'strange' fishing boats coming for hake, the

¹ *La Victorial*, Paris, 1867 (ed. Circourt et Puigaigne).

² In 1403 a grant was made to the prior of St. Michael's Mount to maintain a garrison, as being 'a fortress to protect the whole neighbouring country' (*Foedera*, viii, 341).

³ 'Alamua.' But perhaps Dartmouth. Cf. *La Victorial*, p. 283, and J. H. Wylie, *Hist. of Engl. under Hen. IV*, ii, 322.

⁴ The 'island' at St. Ives may have been walled (J. H. Matthews, *Hist. of St. Ives*, 16); this, St. Michael's Mount, and the castle of Ennor in the Scillies (Pat. 35 Edw. I, m. 46 d.), seem to have been the only Cornish coast fortifications in the mediaeval period. As to Fowey cf. *infra*, p. 484.

⁵ 2 Hen. V, stat. 1, c. 6.

⁶ Rymer, *Foedera*, ix, 218.

⁷ *Rot. Norman.* (ed. Hardy), 1835, 320-9.

⁸ *Rot. Fran. pass.* The tonnage is not usually mentioned in the licence. There is a contemporary song on the miseries suffered by the pilgrims at sea (Wright and Halliwell), *Rel. Antiquae*, pt. i.

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dues to be applied under the supervision of the merchants of Marazion and the fishermen.¹ There was an earlier grant in February, 1392-3, to the bailiffs of Mousehole of quayage for five years to enable them to finish a quay, but this may not have afforded any shelter to ships.²

After the death of Henry V one of the first proceedings of the regency was to sell off the Royal Navy by auction, but the loss was not at once felt because there was no French force capable of contesting the dominion of the sea. There were arrests of shipping in 1428 and 1430, but there was now a general feeling that in this method 'the long coming together of the ships is the destruction of the country.'³ Vessels were still impressed for the transport of troops, but the military service was handed over to contractors who undertook to keep the sea with a certain number of ships and men for a specified time. No doubt the contractors desired to obtain as much money and go to as little expense as possible, and in 1442 Parliament, dissatisfied with the results, prepared a scheme by which a squadron was to be made up of ships from various ports. Cornwall did not supply any of the large ships, but among the barges the *Slugge* of Saltash⁴ was selected, and another from Falmouth; among the balingers the *Palmer* of Fowey, belonging to Sir William Bonville, was chosen.⁵ There are in existence several lists of ships taken up for the transport of troops in 1439, 1440, 1443, 1447, and 1452.⁶ Seeing that they represent only a portion, large or small, of the merchant marine, they show that notwithstanding war and weak government it was still flourishing both in number and tonnage, some of the vessels being of 300 and 400 tons. In these years Fowey supplied nineteen transports; ten were of 100 tons or less, one was of 300 tons, one of 200, and the others between 100 and 200 tons. Saltash sent six ships, one being of 260 tons, two of 160, and the others of 100 tons or under; Landulph five, of which the largest was of 120 tons; Looe five, the largest being of 180 tons; Penzance four, of 120 tons and under; Penryn two, and Truro two, of which the largest was 80 tons; Falmouth two, of which one was 110 tons; Marazion two, and Mergesawe (Mevagissey) one, the largest of the last three being of 70 tons. Sea power played no great part in the wars of the Roses, but both sides had other objects, momentarily more important than the safety of the Channel, to consider. When such legal trammels as existed were relaxed no doubt the men of the western ports took the opportunity to fish in troubled waters with more or less success. In August, 1457, the Seneschal de Brézé, with a combined Norman and Breton force, sacked Sandwich, and the Bretons on their way home made an especial attack on Fowey, which seems to suggest that they had some specific scores to settle with the Fowey men. Half the town was burnt, but subsequent events showed that no great injury could have been done to the shipping. In October, Warwick, the 'king maker,' was appointed guardian of the Channel, and Fowey in particular is said to have attached itself to his fortunes, although in the opinion of Edward IV Cornwall as a whole was Lancastrian; in any case Fowey is not recorded to have done anything striking for Warwick, nor is he known to have made any exceptional use of the Fowey men. The last surge of the war reached Cornwall in 1473, when the earl of Oxford, after an unsuccessful attempt to land in Essex, sailed down Channel, and by an artifice seized St. Michael's Mount on 30 September.⁷ He was besieged there, at first in a friendly manner by the sheriff, Sir Henry Bodrugan and afterwards more strictly by his successor, Richard Fortescue, for four and a half months, and it does not appear even then that force prevailed. The earl's men were enticed away by promises of pardon and reward until only eight or nine followers were left to him, and on 15 February, 1474, he surrendered on promise of life.

In 1429 the Commons petitioned that the crown would deal with the *rovers sur le meere*, who were making commerce impossible, and it may be imagined that conditions did not improve during the succeeding forty years. With the calm that followed the battle of Tewkesbury most of the ports must have accepted the altered situation and turned their attention to ways of peace, but Fowey, among the Cornish towns, stands out as unregenerate. In 1470 there is a list of Spanish ships plundered by Fowey sailors, for which the crown admitted responsibility,⁸ and there are many other cases in which writs of inquiry were issued. In one instance, in 1472, a Fowey ship must have been working the Portuguese coast, for a trader sailing from a Portuguese to a Spanish port was plundered.⁹ At last Edward, who had now time to consider these matters, must have become tired of constantly giving warrants on the customs to compensate the victims of these piratical adventures. It may be that there had been previous warnings, but on 28 November, 1474, a writ

¹ Pat. 6 Hen. VI, pt. i, m. 22. There are several entries on the French Roll showing the existence of a direct trade between Mount's Bay and Spain.

² Pat. 16 Ric. II, pt. iii, m. 23. This patent speaks of Mousehole possessing much English and foreign trade.

³ *Proc. of P. C.* (1st Ser.) v, 102.

⁴ Not sluggish under sail; John Slugge of Saltash was a shipowner.

⁵ *Rot. Parl.* v, 59. ⁶ *Exch. Accts. K.R.* bdle. 53, Nos. 23, 24, 25, 39; bdle. 54, Nos. 10, 14.

⁷ 'With a sotule poynte of werre.' He and his men are said to have gained admission disguised as pilgrims.

⁸ *Foedera*, xi, 671.

⁹ Pat. 12 Edw. IV, pt. ii, m. 23 d.

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issued to the sheriff of Cornwall and others to arrest 'all masters, mariners, pirates, possessors, and victuallers of any ships and vessels of the towns and ports of Fowey, Bodonnek, and Polruan, as they have committed daily depredations . . . and do not heed the king's mandates, but daily do worse.'¹ All the ships, goods, and gear found were to be placed in safe custody. No doubt this is the basis of fact on which is reared the superstructure of popular belief that the ships and the chain securing the port were handed over to the Dartmouth men, one or more of the burgesses executed, and the maritime strength of Fowey destroyed. Whatever else happened, it is certain that its maritime strength was not destroyed, nor was the piratical spirit broken. Between 1483 and 1485 there are commissions of inquiry into four cases of piracy, showing that Fowey ships were still at sea in sufficient number to continue the local industry; and in 1489 and 1490 the town sent the *Christopher* (200),² *Gabriel* (200), *Antony* (140), *George* (120), *Anne* (120), and *Barbara* (110 tons) to the Breton expeditions of Henry VII.³ Except, perhaps, Plymouth, Dartmouth, or Southampton, there was not at that time another town on the south coast that could have equipped so powerful a squadron. The two towers which defended the entrance to the harbour before the construction of St. Katherine's Castle are usually assigned to the reign of Edward IV, but in view of the relations between the town and the king it seems unlikely that he would have regarded favourably the fortification of the place or have made a grant in aid. Moreover, they are of the same type as the castles at Dartmouth, and Dartmouth was fortified long before in consequence of the raid of 1377, so that the towers at Fowey may be of the same period.⁴ The fact that in 1457 the Bretons did not attempt to enter the harbour, but landed to the westward of the town, seems to show that the entrance was protected.

If Cornwall had been Lancastrian earlier, it did not welcome Henry as duke of Richmond when he appeared in Cawsand Bay in October, 1483, but was too cautious to land, and his taxation as king overbalanced its not enthusiastic loyalty. In 1497 Perkin Warbeck, expelled from Scotland, was advised to try his fortune in the county which had already sent a rebel force as far as Blackheath. Warbeck, coming from Ireland, landed at Whitsand Bay (Land's End) on 7 September, 1497, and thenceforward nothing of maritime interest occurs for some years.

With the reign of Henry VIII the era of general arrests and impressment of shipping may be said to have terminated. The port towns were sometimes to be called upon to provide ships, but such towns were usually associated in order to lessen the expense, and eventually the county as a whole contributed to the cost. Improvements in building and armament had now differentiated the man-of-war from the merchantman. The latter was of little use in fleets except 'to make a show,' and to require the ports to furnish real men-of-war would have ruined them. It was one of the purposes of Henry's life to create a national navy, and there was not a year of his reign that did not witness some accretion to its strength. Such merchantmen as he required were hired without the exercise of the prerogative. It is not until the reign of Elizabeth that we find in force the further development of the right of impressment, the demand for fully-armed ships at the cost of the ports and counties, the principle upon which the ship-money levies were based. The first war with France, of 1512-13, was fought chiefly by men-of-war, although there were upwards of twenty hired ships in pay. The *Peter* of Fowey and the *George* of Falmouth accompanied the fleets, but only as victuallers and transports. It need hardly be said that although impressment of ships had practically ceased, impressment of men continued, and Fowey and Penzance helped to make up the crews in 1512.⁵ Shipwrights and caulkers were pressed in Fowey, Saltash, Bodmin, and St. Ives, to come to the new dockyard at Woolwich to build the *Henry Grace de Dieu* in 1513.⁶ It is stated by some Cornish historians that in 1514 a French fleet of thirty ships descended on Marazion and burnt the place, being met on their return by Sir Anthony Ughtred with another thirty ships, and defeated. There is no trace of such an occurrence in the State Papers, but the circumstance is noted on a nearly contemporary map. War with France and Scotland recommenced in 1522, but it was fought out by men-of-war and troops. The state of war was, however, the occasion of ships being stationed in the Channel as cruisers, and the *George* of Fowey was one of the vessels posted between the Channel Islands and the 'Trade.'⁷

About 1539 Henry feared a Continental alliance against the kingdom. The new navy, although more powerful than any England had yet possessed, more powerful than even its creator dreamed it to be, was as yet an untried weapon. The preceding centuries were fraught with the lesson that English battles were best fought on the English seas; but there was a natural inclination, especially in an age that was tending towards formalism in military science, to fall back on the orthodox defences of castles, sconces, and bulwarks to prevent a landing or to support a defending force. The union of Brittany—which as an independent duchy had been sometimes inimical, but

¹ Pat. 14 Edw. IV, pt. ii, m. 15 d.

² Capt. John Treffry.

³ Tellers' Rolls, 62.

⁴ Yarmouth, Harwich, Rye, Sandwich, Winchelsea, Southampton, Chichester, Plymouth, and Dartmouth were all fortified or re-fortified in the years following 1377.

⁵ Chap. Ho. Bks. ii, ff. 7-10.

⁶ Ibid. v.

⁷ Passage de l'Iroise, near Brest.

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more often friendly, to England—with the French crown gave the French kings the services of a race of fine seamen and some excellent ports, and altered considerably for the worse the tactical position of Cornwall. Hitherto, in raids from Normandy, the county had been normally to windward of any attacking force, nor did the traverse offer the short passage presented by towns opposite the Norman coast. But in future wars with France an attack from Brittany would be an obvious proceeding, and the Bretons possessed an additional advantage over the Normans in that their custom of fishing in Cornish waters¹ must have made many of them efficient pilots. It is not surprising, therefore, to find that in the first war with France under the new conditions especial precautions were considered necessary, and in 1513 an Act was passed in haste,² ordering in general terms that bulwarks and defences should be made in Cornwall, and assigning large powers to the justices of the peace under whose superintendence they were to be erected. Probably little or nothing was done when it was found that the French fleets were being securely held in the Breton ports. No further steps were then taken, but in 1535 the idea of a systematic fortification of the strategic points round the coast was in the air, for Cromwell noted in his 'Remembrances' that a small tax formerly paid to Rome might well be diverted 'towards the defence of the realm to be employed in making fortresses.' Moreover, violations of neutrality well calculated to arouse the anger and pride of the king were occurring in the defenceless ports. In January, 1536-7, Spanish ships chased French ones not merely into Falmouth Harbour but up the Truro river, and engaged them twice in Malpas Roads. When ordered to desist, the Spanish commander said that he 'would have them or die for it,' and when, after a third attempt, he sailed away it was probably because he had found himself too weak rather than because Sir John Arundel had threatened to raise the county upon him.³ 'There would be more of such occurrences,' wrote Arundel, 'if blockhouses were not built.' However, in those ages violations of neutrality were frequent enough, and in 1535-7 Calais and Dover were the only strongholds upon which money was being spent lavishly, but the political conditions of 1539 made coast defences elsewhere seem necessary. Early in that year commissioners were appointed 'to search and defend the coasts,'⁴ and Falmouth was of course at once selected as a harbour needing fortification, land on the Pendennis peninsula, belonging to John Killigrew, being leased for the purpose.⁵ The defence of the south-eastern coast was considered to be of more immediate importance, work there being pushed on in all haste, so that it was not until 1540 that Thomas Treffry went to St. Mawes to plan the fort there.⁶ Leland tells us that St. Katherine's Castle at Fowey was built by the same Thomas Treffry, partly at his own cost and partly at that of the town, and that a blockhouse existed at St. Ives.⁷ Other blockhouses were intended at Penlee Point between Newlyn and Mousehole, on Dinnis Head at the entrance of the Helford River and at Gillin south of it, at Trefusis Point in Falmouth Harbour, at Polkerris in Tywardreath Bay, and at Cawsand Bay; but none of these was built.⁸ Leland also mentions fortifications on St. Mary's Island, Scilly, but there is no reference to any expenditure for the purpose until 1548, when they were in the making.⁹ They perhaps originated with Lord Seymour, and were intended to further his designs.¹⁰ In a later paper the castle of Tresco is assigned to the same period.¹¹ At first all the coast defences were placed under the control of the Lord Admiral, and regulations were drawn up for their government,¹² but they soon passed out of his hands. Probably it was considered unwise to entrust a subject with so much power.

War with France and Scotland broke out again in 1543, but the operations were all to the eastward of Cornwall. In August, 1545, Fowey was required to send one ship of 120 tons, Saltash two, of which one was to be of 140 tons, Truro three, Looe three, Penzance one, Millbrook two, and Mount's Bay one, all these latter being small vessels for use as tenders and victuallers, to join the main fleet at Portsmouth. In the same month a circular letter to the western ports warned those concerned that as 'many of the adventurers that are appointed for Portsmouth . . . do slack and draw back from the same, being rather given to spoil and robbery than otherwise to serve His Majesty,' they would indulge those preferences at the risk of their lives. Any value the coast fortifications possessed during this war had been purely moral; and as Henry VIII left the country hampered with debt at his death, they were at once selected for retrenchment, the Privy Council finding that they put the king 'in very great charge, and in no service at all, nor could serve at any time to any purpose.' St. Mawes and Pendennis were among those marked as superfluous,¹³ but neglect rather than actual disarmament seems to have been their fate. In 1557 there was again war

¹ Leland, *Itinerary*.

² 4 Henry VIII, c. i.

³ *L. and P. Hen. VIII*, xii, pt. i, 277.

⁴ *Ibid.* xiv, pt. i, 398. Commissioners were nominated for Somerset, Dorset, Devon, and Cornwall, and included Sir Piers Edgcumbe, Sir John and Sir Thomas Arundel, Sir Wm. Godolphin, and Sir Hugh Trevanian.

⁵ It was not bought by the crown until 1795.

⁶ *L. and P. Hen. VIII*, xv, 426.

⁷ *Itinerary*.

⁸ Cott. MS. Aug. I, i, 35-9.

⁹ *Acts of P. C.* 24 April, 25 July.

¹⁰ Post. p. 488.

¹¹ S. P. Dom. Eliz. Add. xxvi, 12.

¹² *L. and P. Hen. VIII*, xiv, pt. ii, 785; Admir. Ct. Misc. Bks. cxxix (1541).

¹³ *Acts of P. C.* 26 Feb. 1550-1; 4 May, 1552; 21 Nov. 1553

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with France and Scotland, but the hired vessels were mainly victuallers and storeships. In the North Sea, however, Sir John Clere's squadron was not considered strong enough to ensure the safety of the Iceland fleet, and a reinforcement of nineteen armed merchantmen, which included two from Saltash and Fowey, was ordered to join him.¹ In 1558 Cornwall set out four ships, two from Looe and two from Fowey, as privateers under licence from the Lord Admiral. Twenty-two ships from Devon ports obtained licences.

Through several centuries the right of wreck was coveted by manorial lords and corporations, both for profit and incidentally as evidence of exemption from the inquisition of the High Admiral. Legally, if man, dog, or cat escaped alive from a ship it was no wreck; but if the cargo once came into the hands of the dwellers on the coast there was small chance of recovery. Every corporation used what influence it possessed to obtain local jurisdiction in Admiralty matters, not only as a question of dignity and profit, but even more in order to escape the arbitrary and expensive proceedings of the admiral's deputies, who brought much odium on their master. In Cornwall few places obtained such franchises, perhaps because there was not only the opposition of the Lord Admiral to overcome, but also the more potent influence of the earls and dukes of Cornwall, so near the throne. From complaints of the Black Prince, in 1342 and 1343,² we find that the king had recently granted him rights of wreck in the county, and that certain persons had helped themselves, regardless of his privileges, to the amount of £1,000, or according to another statement £3,000.³ Again, in 1345 wrecked goods to the value of 2,000 marks, the rightful perquisite of the prince, were stolen by the people on the spot. Where a corporation possessed Admiralty rights it was to the interest of the townsmen to prevent plunder in the surrounding district, but it is doubtful if any Cornish town ever possessed full maritime jurisdiction to the extent enjoyed by some in other counties, and this may be one reason why Cornish wrecking was so flagrant. There are indications that perhaps Padstow and Saltash once held or claimed such jurisdiction⁴ and a maritime court, but possibly only that held by the officers of the admiral of the south and west fleet, sat at Lostwithiel, which town exercised certain rights to the mouth of the Fowey River. The lapse of years did not improve Cornish morals in either wrecking or piracy, and the former seems to have been effected with a neatness and alertness that speaks of unremitting practice. In 1526 a Portuguese ship was wrecked at Gunwalloe, and much cargo was saved. It was seized by the servants of John Millinton, captain of Mount St. Michael, Thomas St. Aubyn, and William Godolphin, and when the owner appealed to the justices he was told that it was 'the custom of the country,' and that no redress was possible.⁵ A commission of inquiry issued, followed by Star Chamber proceedings; and then the defence, for which any number of witnesses could always be obtained, was the usual one that the owner had sold the property on the seashore.⁶ We shall see that 'the custom of the country' remained immutable through the centuries. In 1566 a Flemish ship was wrecked in Mount's Bay, and the cargo disappeared, 'none of the spoilers of the said goods will bring the same or any part thereof to light.'⁷ In 1589 a richly-laden ship, a prize taken by the earl of Cumberland, was also lost in Mount's Bay, and most of the cargo robbed by Thomas Penres, a 'gentleman of great and good authority.' Other Star Chamber suits of the reign of Henry VIII reveal the lawless condition of the coast still more forcibly. John Amadas and Thomas Moon held an inquiry in Looe church concerning the robbery of Barnard Bullen, of St. Malo, to which the offenders confessed: 'then came there William Kendall with 100 followers, armed with swords, saying they would answer for the robbery, abused the commissioners, and put them forth in peril of their lives, so that they were fain to flee secretly out of the church and town.'⁸

The question of piracy and wrecking became more prominent during this reign, not because the offences were more prevalent—there were probably fewer cases than during preceding centuries—but because suppression was taken in hand more seriously. Henry loved law and order, although, to the discomfort of many of his subjects, he insisted on being the final arbiter as to what constituted both. It had been found that the existing system of trial for piracy was nearly useless, the offender having to confess before he could be sentenced, or his guilt having to be proved by disinterested witnesses, who, naturally, could seldom be present at sea. By two statutes, 27 Hen. VIII, c. 4, and 28 Hen. VIII, c. 15, such crimes were in future to be tried according to the forms of the common, and not as hitherto the civil, law. Probably for the better administration of these statutes, and for other reasons—namely, the execution of a treaty with France in 1525 concerning maritime depredations, the strict protection of the king's and Lord Admiral's rights in wrecks and other matters, the registration of ships and men available and the levy of seamen, the inspection and certification of ships going to

¹ S.P. Dom. Mary, xi, 38. The crown gave up its share in prizes for the benefit of the crews.

² Pat. 16 Edw. III, pt. iii, m. 14*d*.

³ Ibid. 17 Edw. III, pt. i, m. 34*d*.

⁴ Marsden, *Select Pleas in the Court of Admiralty*, I, xlix; II, xxi.

⁵ L. and P. Hen. VIII, iv, pt. ii, 2815.

⁶ Star Chamb. Proc. $\frac{10}{208}$, $\frac{10}{101}$.

⁷ Acts of P. C. 31 Dec. 1566.

⁸ Star. Chamb. Proc. $\frac{10}{110}$. A similar case happened at Calstock.

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sea touching their armed strength and the peaceful nature of the voyage, the exaction of bonds from captains and owners as security for good conduct, and the safe keeping of prizes and prize goods—it was deemed advisable to have permanent representatives of the Lord Admiral round the coast who should be of higher social standing than the deputies who had hitherto acted for the Lord Admiral in each county or district. The officers in question, the vice-admirals of the counties, were in some of their functions the successors, historically, of the keepers of the coast and the conservators of truces of the thirteenth and fourteenth centuries, and there are traces of intermediate occasional appointments of the same character, but they now became an organized band of crown officials¹ backed by the power of the Tudor despotism, and continued without any interruption, during which their authority might diminish by intermission. The scheme did not come into operation simultaneously over all England, but developed out of necessity and according to opportunity. The earliest nomination known by precise date is for Norfolk and Suffolk, but Cornwall followed closely, and may even be earlier, for Thomas Carew was acting in or before 1536 as vice-admiral for Devon and Cornwall.² The post was usually held by nobles or country gentlemen, for whom it was a source of influence and profit; the chief gains were from the produce of wreck and salvage, usually shared with the Lord Admiral, or from less lawful receipts.³ They had to give bonds to render their accounts half-yearly, but this duty was often ignored, and about 1553 ordinances were drawn up by which they were to regulate their conduct and that of their subordinate officers. Cornwall and Devon were soon severed into separate vice-admiralties, and the former was one of the richest in the gift of the Lord Admiral. It excluded the Scillies, which were leased by the Godolphins, and finders of cargo were, there and elsewhere, entitled to half the value if no claim was made, a custom that had existed 'time out of mind,' and that perhaps sometimes ensured that no claim would be made. Yet, notwithstanding these deductions, the vice-admirals' accounts occasionally reached thousands of pounds, and it was probably these large amounts that decided the Lord Admiral in 1601 to subdivide the county permanently into north and south vice-admiralties,⁴ the southern district extending from the Rame Head to the Land's End, thence inland to St. Erth Bridge, Camborne, Horsebridge on the Tamar, and down to the Rame Head again.

Although the perquisites were so valuable, the vice-admirals were, as Carew insinuates, sometimes more than suspected of illicit practices, especially in their relations with pirates. In 1563 there was a general order that they should only act in conjunction with the commissioners for the suppression of piracy, in order to avoid any appearance of connivance 'of which complaints have been made.'⁵ In 1570 William Lower ignored an order of the Privy Council to restore certain goods taken by John Michell of Truro, which 'they impute unto him bearing with the said Michell'; as Lower remained recalcitrant he was finally directed to present himself before the Council.⁶ Six years later he was again before the Council for illegally detaining cargoes,⁷ and he rounded off his procedure in 1579, though then no longer vice-admiral, by being at last fined for transactions with pirates.⁸ But a month after he was fined, John Arundel, the then vice-admiral, was called upon to explain his dealings with a pirate who took a Scotch ship from Torbay to Helford River, and sold the cargo to Arundel and others.⁹ It was during these years that Helford earned its second name of 'Stealford River,' being favoured by pirates because it was unfortified and was under the jurisdiction of the Killigrews. John Killigrew, one of this family, always an extremely irregular one in its proclivities, was the most extraordinary vice-admiral that even Cornwall produced. In November, 1588, he was marching about the county with an armed retinue, and the sheriff was directed to levy a sufficient force to capture him, and to storm Pendennis if necessary. When the detailed story of his proceedings filtered through it was found to be made up of 'outrages, disorders, and riots,' and the Council requested the Lord Admiral to remove him from his office.¹⁰ In 1580 a commission was issued to inquire into the conduct of the then vice-admiral, by whose negligence or connivance a pirate named Husson and most of his crew had escaped from Falmouth.¹¹ Yet another vice-admiral, Edward Seymour, was so far under suspicion in 1587 as to be ordered to appear before the Council if he could not, or would not, produce a subordinate who had bought goods from pirates in the Helford River.

¹ The patents of appointment were from the Lord Admiral, sometimes for life, and sometimes during pleasure.

² I am greatly indebted to Mr. R. G. Marsden, to whose learned researches the history of the evolution of the office of the vice-admiral is mainly due, and who has given generous help in questions of legal and local history.

³ Carew (*Survey*, ed. 1769, p. 87), in his praise of the then vice-admiral, Charles Trevanion, as being free from greed or dishonesty and careful of his reputation, hints very plainly at the methods of some others.

⁴ Admir. Ct. Misc. Bdles. ser. ii, 240. Nottingham to Judge of Admiralty Court.

⁵ *Hist. MSS. Com.* (Cecil MSS.) i, 286.

⁶ *Acts of P. G.* 24 May, 18 June, 1570.

⁷ *Ibid.* 30 Aug. 1576.

⁸ *Ibid.* 11 Feb. 1578-9.

⁹ *Ibid.* 29 Mar. 1579.

¹⁰ *Ibid.* 20 Nov. 1588; 20 April, 1589. See also *post*, p. 490.

¹¹ *Ibid.* 15 July, 1580.

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The early Cornish vice-admirals were less trustworthy than those of any other county, and so far as the suppression of piracy depended upon them, it is not strange to find that it flourished exceedingly within their jurisdiction. But their action or inaction was only a minor factor; the western Channel was the natural field for licensed or unlicensed cruisers, the Cornish havens a natural refuge sheltered from an unwelcome publicity, and the conception of policing the seas was only in its embryonic stage. However, as in former centuries, it is difficult sometimes to distinguish between the proceedings of privateers and of pirates proper, for the documents occasionally show plainly that what the officials called piracy was really a case of prize or reprisal. The war of 1543 was opportunity for an outburst of privateering so successful that it alarmed the king, who was compelled finally to order that all privateering from Cornwall, Devon, and Dorset should be stopped, and all privateers at sea should be recalled, in consequence of the plundering of the emperor's subjects.¹ This may have been advisable for political reasons, but if the privateersmen were taking French goods out of imperial ships, it does not follow that they were doing anything illegal. It was no doubt a man of this class who had invested his savings in a maritime speculation who is described as the owner of an inn at Falmouth, and further as a pirate.² Another respectable delinquent was a burgess of Penzance, and in many of these cases of 'notable piracy and disorder,' the culprits were given the option of paying the claimants the value of the property seized, which shows that the offences were more civil than criminal. That real piracy existed and increased after the death of Henry VIII is not surprising in view of the European turmoil that lasted half a century, the weakness of the government, and, frequently, the secret encouragement of underhand practices. Thus in 1548 relations with France were very strained, and the authorities in Devon and Cornwall were directed by the Privy Council to encourage shipowners to equip privateers to seize French ships on the plea of retaliation, 'pretending' that they had formerly lost goods themselves and could obtain no redress in the French courts.³ In the event of peace continuing the captors were to return the cargoes and have their expenses paid by the government. Both parties must have understood this promise as the homage that vice pays to virtue. In the following year the Lord Admiral, Lord Seymour, was beheaded for reasons of state, and amongst the articles of accusation were several charging him with dealings with pirates, 'as though you were authorized to be the chief pirate and to have all the advantage they could bring unto you.'⁴ Whatever may be the truth about the ambitious schemes that cost Seymour his life, there is collateral evidence that these charges were well founded, and for the furtherance of the former he was said to have endeavoured to get into his own possession 'the strong and dangerous Isles of Scilly.' Seymour's supposed plot drew fresh attention to the Scillies, and in November, William Tyrrell, a naval officer, was sent with instructions to survey them and report on the harbours, fortifications, and other matters,⁵ and when war commenced again in 1557 the garrison was strengthened by forty men during the summer.⁶

The reign of Mary sent many of the outlawed and the discontented to the refuge of the sea, and the more or less continuous warfare existing in western Europe during that of Elizabeth tempted many of such men to continue their vocation. The Killigrews constantly appear in disreputable circumstances during the second half of the sixteenth century; in 1555 Peter Killigrew was arrested, and a year later had the distinction of being in the Tower. He seems to have been liberated and to have immediately resumed his occupation. In 1557 we find, from the pleadings of a case in the Admiralty Court, that this Peter, with his brothers John and Thomas and others, sank a Spanish ship off the Land's End, and took the cargo, worth £10,000, to the Scillies. The plaintiff, who had found that 'there was no justice to be had in Cornwall,' had sued twenty-five men in the county, but John Killigrew, the father, captain of Pendennis Castle, hid them or caused them to abscond. Thomas and Peter Killigrew had both been in the French service, and, when peace was made between France and the Empire, took to piracy, 'and for pyratts and rovers they have byn commonly knowen.' The Scillies were becoming a favourite haunt of these outlaws, and in 1556 Jacob Tompson was cruising off the islands with three ships so persistently, that the earl of Bath was told to persuade Devon and Cornwall owners to fit out ships to take him, the captors being promised the queen's and Lord Admiral's share of what was taken.⁷ In 1564 a great seaman, although no Cornishman—Martin Frobisher—was in Launceston gaol. He and others, under cover of letters of reprisal against French Catholics, had captured a ship with tapestries on board for Philip II. They took their prize to Ireland, and there purposely wrecked her, sending over the cargo in small craft to St. Ives, where it was received by Peter Killigrew and Richard Erizo. St. Ives must have been a suitable mart for stolen goods, for in 1564 the inhabitants, led by the constables, boarded and plundered a Dutch ship in the harbour on their own account.⁸

¹ *Acts of P. C.* 13 April, 1546. ² *Ibid.* ³ *S. P. Dom. Edw. VI*, iv, 39. ⁴ *Acts of P. C.* 23 Feb. 1548-9.

⁵ *S. P. Dom. Edw. VI*, ix, 54.

⁶ *Acts of P. C.* 6 July, 1557.

⁷ *Ibid.* 25 Aug. 1556.

⁸ *Admir. Ct. Libels*, 36. If there were any prospect of profit Peter Killigrew had no prejudice against the law; in 1568 he laid an information concerning uncustomed rubies and ambergris brought ashore at the Land's End, no doubt with an eye to the informer's share (*Exch. K. R. Mem. Roll*, 356 R. 281 Hil.).

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The peace of 1564 and the protests of neighbouring powers forced Elizabeth to more energetic action, and a circular letter to the vice-admirals of counties called their attention to the suggestive fact that, although many pirates had been taken, 'not one executed.'¹ Early in 1565 Sir John Chichester and Sir Peter Carew were especially inquiring in Devon and Cornwall,² but the difficulty to be dealt with not only related to catching the pirates, but to getting them convicted when caught. Their friends, partners, agents, informants, and customers were to be found in every class of society, and while Carew and Chichester were in Cornwall they were ordered to send up the jury that had acquitted Akers, one of the fraternity, that the jurymen might explain their reasons in the Star Chamber.³ Then fresh commissioners were nominated for each county,⁴ with large powers, and they were to have deputies at every creek and landing place. The commissioners displayed a healthy activity, and Mohun immediately laid an information of fifteen articles against Sir William Godolphin and the Killigrews, of which thirteen concerned piracies; but on the whole their proceedings were not of much avail, especially when the business became further complicated by the action of the Prince of Orange's privateers, many of which were English ships or had Englishmen on board; the Orange privateers were an element of *la haute politique*, and Elizabeth did not consider it discreet entirely to crush them even if it had been in her power to do so. Subsequently the obedient Netherlands followed the example of the Dutch and sent out privateers, the beginning of the affliction of 'Dunkirkers' that plagued the coast for more than a century, and Englishmen also took letters of marque from the Huguenot leaders in France. In September, 1577, fresh commissioners were appointed and still more stringent methods of repression adopted;⁵ the aiders and abettors ashore were now to be prosecuted and fined, and the fines were to go towards recouping the victims; the takers of pirates were to have a proportion of the goods found on board, and commissions were to be granted to private persons to send out ships pirate-hunting.⁶ Three months earlier the leading commissioner, Killigrew, had been found to be dealing with a pirate, Robert Hicks of Saltash, but had been allowed to compromise with the owners. This man Hicks was nearly the cause of serious international trouble. One of the sufferers by his exploits was a Dane, who after having received £200 out of the fines, suddenly protested and prepared to leave, perhaps under the influence of secret threats. The Council, fearing that the king of Denmark would issue letters of reprisal, ordered the Lord Mayor to convene a meeting of merchants trading to the Baltic, and 'persuade them' to advance the balance of £1,000 required, to be repaid as the fines were levied. It was no wonder that the queen, understanding that 'divers gentlemen of Devon and Cornwall' were equipping ships 'in warlike sort,' issued urgent orders that sureties should be taken from them not to do anything of the kind.⁷ Between the risks of the law and the risks of the sea privateering must have been a hazardous speculation even if carried on honestly; thus, in 1576 Sir Richard Grenville was before the Council charged with piracy, but there is little doubt that it was only a prize case of enemy's goods in a neutral ship.⁸ For many of the counties there are extant long lists of persons fined for dealing with pirates, and Cornwall held its place among them. The amounts varied from £2 to £30, and, of course, a Killigrew was named in the roll of offenders; Oliver Carminow, Thomas Lower, John Tregose, Justin Tolcarne, and Walter Rashleigh, other well-known Cornish names, are also there. Doubtless the lists would be still longer but for the partiality of officers and juries. In June, 1580, the Council inquired of the sheriff of Cornwall why certain pirates condemned two months before were yet not executed. They added that they supposed that the delay was for some good reason, or 'they might have thought the same to proceed of some partial inclination towards the parties condemned.'

Another renowned Cornish pirate was John Piers of Padstow, whose career, in the official papers, begins in 1552. He was supposed to have had relations with Seymour in 1549 or earlier, and his long and successful course was attributed to his mother being a witch. Perhaps the 'rich merchandise hidden in the cliffs by Padstow' in 1571 was some of his booty, and he was on sufficiently friendly terms with the vice-admiral of the county to send him presents.⁹ Piers's greatest triumph just preceded his fall. In September, 1581, the mayor and jurats of Rye wrote to the

¹ *Acts of P. C.* 23 Dec. 1564.

² Commissioners 'for Causes of Depredations,' appointed in 1564.

³ *Acts of P. C.* 16 March, 1564-5.

⁴ *Ibid.* 8 Nov. 1565. John Trelawney, Hen. Chiverton, Ric. Channon, and Reginald Mohun for Cornwall.

⁵ S. P. Dom. Eliz. cxv, 32. For Cornwall: Sir John Killigrew, Wm. Mohun, John Carmiow, John Arundel, Edmund Tremayne, Ric. Channon, Fr. Godolphin, and the Mayor and Recorder of Falmouth.

⁶ Add. MS. 34,150, ff. 61, 64. In 1559 the judge of the Admiralty Court held that all goods must be restored to the owners (S. P. Dom. Eliz. vi, 19); therefore this must refer to property belonging to the pirates or unclaimed. There had been some legal doubt whether accessories ashore could be prosecuted (*Acts of P. C.* 6 June, 1577).

⁷ *Acts of P. C.* 11 July, 1577; 24 March, 1577-8. Hicks was hanged.

⁸ *Ibid.* ix, 111, 130, 132.

⁹ *Ibid.* 12 April, 1571; S. P. Dom. Eliz. cxlviii, 49.

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Council that he had been blockading the harbour for a month 'as that none can go forth or come in.' When asked for details it appeared that the pirate flagship was of only some 35 tons, with a consort of 18 tons; the maritime strength of Rye was quite equal to dealing with them, but 'those that are willing to venture would gladly be entertained with some consideration' before taking over the duty of the government.¹ A month later he was taken 'by chance' in Studland Bay, but escaped from Dorchester Gaol 'by the corruption of the keeper;' he was killed in 1591. In 1582 the Killigrews are to the fore again, but this time it was a lady who played the leading part—Mary, the wife of Sir John, still one of the commissioners of piracy, who was, or pretended to be, ignorant of the crime. A Spanish ship put into Falmouth, and was boarded by a gang of men who, after removing the booty to Arwenack, took the ship to Ireland after throwing most of the crew overboard. A Cornish jury found that there was no evidence to show by whom the deed was done, upon which the owners appealed to the Privy Council, who soon found out that the plot originated with Lady Killigrew.² In this instance both the jury and Sir John seem to have escaped penalty, but in 1588 neither the jury nor his son was so fortunate. Just when it was of vital importance to Elizabeth to keep on good terms with the northern powers, and with Denmark especially, another case similar to that of Hicks occurred. Twice the juries acquitted the prisoner, and in consequence were sent for to appear before the Star Chamber to be 'proceeded against with that extremity the grave censure of that High Court may lay upon them,' while secretaries of State were effusive in apologies and promises to the Danish Court. John Killigrew—his share in the matter is obscure—was called upon to pay £440, and eventually warrants issued to arrest him and Josias Calmady, the owner of the offending ship.³ In 1595 Killigrew was charged with warning Elliott, a pirate lying in the Helford River, of the approach of H.M.S. *Crane*, supplying him with provisions and taking valuable property in payment.⁴ Elliott was something worse than a pirate. Unlike most of his kind, who were usually loyal enough to England, he was a traitor, and shortly afterwards entered the Spanish service. It was, perhaps, a consequence of Killigrew's intimacy with him that cautions about his loyalty were sent by the English spies in Spain, it being stated that he had promised to deliver Pendennis into Spanish hands when Philip's fleets appeared.⁵ The Scillies maintained their reputation as a haven for pirates to the end of the reign. In 1603 a Marseilles ship was plundered off Cape de Gatte by one William Harvy, who took the cargo to St. Mary's Island and sold it to Robert Penwarden, the deputy governor, and others. The owner, Anthony Morier, obtained an order from Sir Francis Godolphin to his son John, the lieutenant of Scilly, but John Godolphin expelled Morier, and a further appeal to Sir Francis only brought an assurance that he would answer for the islanders, but no assistance. When they caught Morier at Plymouth the vice-admiral of Devon committed him to prison presumably as an objectionable person.⁶

It is an historical commonplace that the reign of Elizabeth was a period of maritime expansion, but, like most historical commonplaces, it is to be received with caution. It is true that it was a period of maritime expansion, but that was not because of any sudden discovery by Englishmen that they were seamen and fighters, but because it followed the removal of external pressure in the helplessness of France, and because of the fact that the new enemy was at sea as a child to an armed man. For centuries English sailors had been combating Normans and Bretons, as good fighters, and—the latter especially—nearly as good seamen as themselves. They had held their own as pirates or privateersmen—whichever term be preferred—against northern Europe. The Spaniards, as a nation not seamen at all, and but mediocre fighters on shipboard, were officered by soldiers who held manuals of drill and questions of precedence to be more important at sea than the advice of the few expert sailors they possessed. Thus Spanish military fleets were usually scattered or destroyed by weather or their own unseaworthiness before they came into contact with their enemy; and while Spanish sea-borne commerce offered a profitable field to the English shipowner, his success not only increased the carrying trade, but brought fresh speculators in privateering into the business, with a concomitant demand for seamen, until the Spanish flag was

¹ *Hist. MSS. Com. Rep.* xiii, App. iv, 78, 79.

² *Acts of P.C.* 13 March, 1581-2; S. P. Dom. Eliz. 15 Jan. 1581-2; *Journ. of Roy. Inst. of Cornw.* vii, 284. Sir John's proceedings were so inconsistent with innocence that the Council ordered him to be arrested.

³ *Acts of P.C.* 1 April, 5 Sept. 1588. It was after this that Killigrew was parading with an armed guard, and the Council requested Lord Howard to remove him from the office of vice-admiral (*ante*, p. 487). He was the third John Killigrew in succession; the second succeeded to the estates in 1567, and died in 1584.

⁴ *Hist. MSS. Com.* (Cecil MSS.) v, 519.

⁵ In 1689 another Killigrew—Sir Peter—went with an armed force to Penryn and seized £201 in the custom house there, saying that he required the money to repair Pendennis. He brought away the collector of customs and imprisoned him in the castle (*Treas. Papers*, 21 March, 1688-9).

⁶ Add. MS. 5,664, fol. 401. See also the 'Maritime Hist. of Devon.'

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completely driven off the seas.¹ Nor, when came the call for men, were the western counties unequal to the demand. Besides the normal fisheries and ordinary sea voyages, there had been during the sixteenth century one growing maritime trade—the Newfoundland—on which, and not on the ephemeral profits of privateering, their prosperity was based. The especial benefit of this new trade was that it not only employed trained seamen, but necessarily required a certain number of ‘green hands,’ of whom a proportion became sailors by profession. There are no statistics for the early years, but there are references which indicate the increasing importance of the commerce. In 1497, after Cabot’s return, an Italian resident in England wrote that the discovery of the fishing grounds would kill the Iceland trade, and his prophecy was not long in showing signs of fulfilment. In 1517 there were 300 English fishing vessels at Iceland, but by the end of the century the number had fallen to less than one-third, and was confined to the east coast. By 1542 the Newfoundland fishery had become of sufficient importance to require a clause in an Act of Parliament (33 Hen. VIII, c. 11), and in 1548 there was a ‘great’ Newfoundland fishing fleet causing anxiety for its safety.² Again, the statute of 2 & 3 Edw. VI, c. 6, forbids exactions by officials in the Newfoundland as well as in other fisheries. In 1578 we have the first statement of the actual number of English fishing ships at Newfoundland, when we read that they had increased from thirty to fifty ships within the last four years, but the writer adds that there were more in some years than in others.³ At this time there were more Spanish, French, and Portuguese than English, but the war nearly ended the French and quite ended the Peninsular trade, which a contemporary Spanish writer thought meant a loss of £600,000 a year in the purchase of fish from abroad, a great part of which was supplied directly or indirectly by Englishmen. In 1585 a warning was sent to the fishermen on the Banks that the Spaniards had seized English ships in Spain, and in 1594 we have another statement telling us that 100 sail were due home in August,⁴ which indicates the increase following the destruction of the Spanish and Portuguese fisheries. In 1615 there were 250 fishing ships of 15,000 tons, with 5,000 men, of whom one-fifth were ‘green hands’;⁵ in 1620 there is an estimate of 300 ships,⁶ and this last corresponds with a complaint from Poole in 1628 concerning the loss of trade, in which it was stated that the ports from Southampton to Bristol used to send 300 sail and 6,000 men.⁷ A little later we have the names of the towns chiefly interested: those in Cornwall are Saltash, Looe, Fowey, Mevagissey, St. Austell, Falmouth, St. Mawes, St. Keverne, Penzance, St. Ives, and Padstow,⁸ but Looe and Fowey ranked with the leading towns in the trade in 1616.⁹ Probably most of the other places mentioned were principally concerned in the supply of men. A paper assigned to 1634 gives the recent yearly average from the western ports at 26,700 tons of shipping and 10,680 men; this was the high-water mark of prosperity in the trade for the time.¹⁰

For many of the counties war only commenced with the formal rupture with Spain in 1585, but the west country cannot be said to have been ever at peace during the reign of Elizabeth. The enmity with France which culminated in the attempt to hold Havre in 1563 gave employment to western men and ships, and on the south coast there was never any real cessation of maritime activity. From the reign of John it had been customary to require periodical returns of the number of ships and men available; most of the earlier returns have perished, but an unusually long series, complete or fragmentary, survives for the Elizabethan period. Besides thus gauging the increase of shipping the council were kept informed what levies were available for war squadrons. The differentiation of the man-of-war from the merchantman had so far altered the character of warfare that only vessels of 100 tons and upwards were now considered suitable for fighting purposes, and an especial return of those was generally required; it was not yet realized in official circles that the age of the fighting merchantman was over, although the seamen tried to impress the politicians with the fact that the armed merchantman was, as they put it, ‘only fit to make a show.’ However, customs alter but slowly, and numbers give confidence, therefore the bulk of every fleet consisted of such ships, although all the real work was effected by the men-of-war. The first return was of 1560,¹¹ when Saltash and Fowey each possessed one vessel of upwards of 100 tons, and the county had 1,703 seafaring men available. In 1570 twenty-six ships and 1,097 masters and men were embargoed;¹² what numbers of either were at sea is unknown. Between 1571 and 1576 Looe had

¹ It must not, however, be supposed that successful privateering has ever decided a naval war in former times. The policy of Elizabeth, both in general and particular, was bad, but that of Philip II was much worse. The naval history of this period is treated in detail in *The Naval Tracts of Sir William Monson*, edited by M. Oppenheim, Navy Records Society, 1902.

² In 1536 Wm. Butler of Polperro was sailing a Newfoundland ship.

³ Hakluyt, *Voyages* (ed. 1888), xii, 300.

⁴ *Hist. MSS. Com.* (Cecil MSS.) 20 July, 1594.

⁵ R. Whitbourne, *A Discovery of Newfoundland*, 1620.

⁶ Mason, *Brief Discourse of Newfoundland*.

⁷ S. P. Col. x, 78.

⁸ S. P. Dom. Chas. I, ciii, 43.

⁹ *Hist. MSS. Com. Rep.* ix, App. i, 271.

¹⁰ S. P. Dom. Chas. I, cclxxix, 70, 73.

¹¹ S. P. Dom. Eliz. xi, 27.

¹² *Ibid.* lxxi, 48.

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built one ship of 160 tons, and Fowey one of 240,¹ and in 1577 there were, as well, belonging to Fowey, three of from 100 to 160 tons, and one of 100 tons to Looe.² A list of 1572 of coasting traders, prepared by a customs official, assigns fifty-one to Cornwall, of which nine belonged to Fowey, six to Padstow, seven to Saltash, four to Looe, and thirteen to Millbrook.³ By 1582 these figures had not altered much, Saltash being the same, and Looe and Fowey respectively one more and one less, but Padstow had risen to twelve; the number of 100-ton ships had decreased to three, all owned in Fowey.⁴ In 1583 the last full return of sea-going vessels gives Cornwall still the three of 100 tons and upwards, two between 80 and 100 tons, and sixty-five of from 60 to 80 tons.⁵ To man the ships there were 108 masters and 1,815 men.

From these data it would seem that, whatever may have been the case with the rest of Cornwall, Fowey had fallen back from the position it occupied in the reign of Henry VII.⁶ The bounties paid at this time on new ships of 100 tons and upwards show that London was making enormous progress as a shipowning centre, and absorbing much of the ocean trade that had formerly been divided among many ports. Places like Bristol, Newcastle, and some of the east coast ports, centres of distribution for manufactures or raw material, were following London, and there was little left for many of the west-country ports which had previously possessed a foreign trade except the local and Newfoundland fisheries and a coasting traffic. In contrast to the flourishing industry existing farther eastward there was little or no shipbuilding beyond that sufficient to supply local demand. Timber was comparatively scarce and dear, as were also most of the other requisites, and freight must have been prohibitive in comparison with the cost at places nearer the centres of import. The same disabilities continued later, and during the seventeenth and eighteenth centuries Cornwall obtained practically no share of the lucrative contracts for building men-of-war that occupied private yards from Hants to Durham.

As Cornwall lay now in the main stream of maritime movement events of interest happened in its ports before the occurrence of regular war. In 1568 a fleet of Spanish ships carrying half a million or more of money intended for Alva took refuge in Fowey, Plymouth, and Southampton in order to escape the Dutch and French privateers. Two vessels with 600,000 ducats on board went up to Saltash, and Sir Arthur Champernowne, the vice-admiral of Devon, who at this moment himself had three privateers at sea, urged Elizabeth to allow him to seize it, adding that 'anything taken from that wicked nation is both necessary and profitable to our commonweal.'⁷ Elizabeth did not require much persuasion, and after a little hesitation the treasure was taken simultaneously at the three ports, nominally to ensure its safety. At Fowey the money was lodged in the house of Mr. John Treffry. This act caused an immediate arrest of English residents and goods in the Low Countries, which was followed by a retaliatory order against Philip's subjects in England with a mandate to capture Spanish and Flemish ships at sea. This last order incidentally throws considerable light on the so-called piracy of the time, much of which might be legal or illegal according to the political needs of the moment. In 1574, one of the many critical situations with Spain had recurred, and preparations had been made for defence. After the danger had passed Elizabeth caused her thanks to be transmitted to 'the gentlemen of the west' for their diligence and zeal, 'which shall be holden in remembrance to their comfort.' In Cornwall letters of thanks were sent to Arundel, Edgcumbe, Grenville, Mohun, and Arundel of Trerice.⁸ Although Plymouth was the favourite port, the Cornish harbours were often points of departure and arrival in the voyages to the westward which Spain was forcing upon English adventurers. On 20 September, 1565, John Hawkins arrived at Padstow on his return from his second West Indian voyage, and on 25 January, 1568-9, he came to the 'unhappy end' of his third voyage, with the few survivors, at Mount's Bay. John Newbery and Ralph Fitch put into Falmouth in March, 1582-3, on their voyage to India, and that harbour was used to some extent by several of the purely military expeditions.

No doubt the county furnished men, if not ships, for Drake's squadrons of 1585 and 1587, but when 1588 came the year brought anxieties of defence rather than thoughts of over-sea offence. In a lethargic fashion the government had for some years been preparing for the time of trial in the way of organizing the local musters and placing the coast defences in a more efficient condition. In 1570 St. Mawes and Pendennis were the only fortifications in Cornwall; the former was armed with six heavy guns in bad condition, the castle itself was out of repair, and the blockhouse at the water's edge unfinished; the latter possessed eight guns and was also out of

¹ S. P. Dom. Eliz. cvii, 68.

² Ibid. xcvi, fol. 267.

³ Ibid. Add. xxii. The largest Millbrook vessel was only of 35 tons.

⁴ S. P. Dom. Eliz. clvi, 45.

⁵ Harl. MS. 4,228, fol. 45.

⁶ In 1565 it was noted as having been retrograding for the past thirty years, although still possessing a local trade (Exch. Spec. Com. 2,860).

⁷ S. P. Dom. Eliz. xlviii, 60.

⁸ *Acts of P. C.* 24 October, 1574. In the council minute only surnames are given.

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repair.¹ Nothing was done for ten years, when another inspection was ordered, followed by further inaction until 1583 and 1584, when some £9,000 was at last devoted to restoring and re-arming the forts. Nothing, however, was allotted for St. Mawes, the captain of the castle being bound to keep it in repair,² an obligation which, as inspection was spasmodic and at long intervals, sufficiently explains its ruinous state. The military schemes were intended to defend Falmouth and Plymouth as the two most tempting ports, and it was proposed to concentrate the levies of Somerset, Devon, and Cornwall at these places. There is a map of this date³ which, taken in conjunction with some notes of Burghley's,⁴ seems to point to a design of defending every possible landing place with barricades and entrenchments. The plans, naval and territorial, remained inchoate to the last, though new proposals were under discussion nearly every week.

On 1 April 1588 the more important coast towns were ordered to equip ships, all to be above 60 tons in burthen; Fowey and Looe were to send one ship and one pinnace, and Saltash was coupled with Plymouth and Tavistock for three ships and a pinnace. They were to join Drake's fleet at Plymouth.⁵ The Saltash ship was the *John Trelawney*, 150 tons, Captain Thomas Meek; that from Looe and Fowey the *Frances* of Fowey, 140 tons, Captain John Rashleigh. From a later paper we learn that Rashleigh advanced the money to fit out the *Frances*, and in July had been able to recover only £100 from the towns. The deputy-lieutenants of Cornwall were directed to assess the adjoining hundreds, as it seems to have been admitted that Looe and Fowey were too poor to bear the expense alone.⁶ On Friday and Saturday, 19 and 20 July, the Armada could be watched by the country people flocking from inland to the Lizard, Pendennis, and St. Mawes,⁷ and that was all that Cornwall saw of it. Like all the other armed merchantmen the Cornish ships did no more during the historic week up Channel than hamper the movements of the men-of-war, and hover round in the hope of picking up a winged bird. On 17 April, 1589, Norreys and Drake left Cawsand Bay in command of the lamentable Portugal expedition, and the *Frances*, Captain Dyer, and *Minion*, Captain Atkins, both of Fowey, were units of the fleet. This great failure deterred Elizabeth from expensive adventures for some years, and the county was not called upon again until 1596 to assist the crown with ships. Sea life was a prosperous occupation during the second half of the sixteenth century for those who survived disease and minor risks, and no doubt Cornish seamen were profitably occupied about their own concerns. Most of the smaller expeditions sent out by Cumberland, Raleigh, and others must have had a quota of Cornishmen among their crews; and the fact that the Cornish motto 'One and all' became accepted throughout the royal and merchant services for more than a century as the rallying cry of discontented or mutinous crews points to a general infiltration of Cornishmen in both services. In 1591 some armed merchantmen were wanted to strengthen Lord Thomas Howard's fleet destined for the Azores, and Padstow was asked for one, but pleaded that nothing above 23 tons belonged to the town.⁸ It was on this voyage that Sir Richard Grenville in the *Revenge* fought his famous fight. There were probably many Cornishmen among the crew of the *Revenge*, and we know the name of one, Thomas Benson, 'a canoneer,' who was passed back to the county with an order from the Privy Council that if his story was true he was to be pensioned from the fund for maimed soldiers.⁹

During these years Elizabeth was always filled with alarm about invasion, while Spaniards were trembling in dismay of the English fleets, and the year 1591 was characterized by special fears about the Scillies. It was true that the Spanish strategists had had them in mind for twenty years, and continued to bear them in mind; but that only proved their inability to grasp the conditions of the problem before them. English admirals did not tremble for the Scillies, but the queen seldom paid much attention to their opinions; and Sir Francis Godolphin, who had obtained a fresh lease of the islands from 1570, and to whose pecuniary interest it was to have a garrison and fortifications there, lost no opportunity of exciting her apprehensions. In May, 1591, Raleigh was sent down with a commission to organize the defence of Cornwall and the Scillies, and the garrison of

¹ S. P. Dom. Eliz. xcvi, 9, i.

² Ibid. clxx, 91.

³ Cott. MS. Aug. 1, i, 6.

⁴ S. P. Dom. Eliz. 17 November, 1587.

⁵ *Acts of P. C.* 1 April. These were independent of the ships taken up and paid for by the government.

⁶ Ibid. 14 July, 1588. Rashleigh has the reputation of having been a successful privateersman, and the *Frances* is said to have made a fortune for him (Hals). This Rashleigh, or one of the same family, was also a merchant; in 1611 a pirate took a trader on the Guinea coast belonging to 'Rashleigh of Fowey.' Another Fowey worthy whose name should be remembered is Edward Rawes, who had been employed by the government, but at his own risk, to watch the movements of a Spanish fleet. He was taken and died in the prisons of the Inquisition—how, is not said. In 1580 his widow was granted the privilege of exporting 200 quarters of corn (*Acts of P. C.* 26 May).

⁷ It was in sight from Pendennis on the Saturday (*Diary of Th. Enys*).

⁸ *Hist. MSS. Com.* (Cecil MSS.) 25 June, 1591.

⁹ *Acts of P. C.* 11 January, 1595-6.

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St. Mary's was increased by sixty men for the summer.¹ In March, 1591-2, Robert Adams, who was in charge of the fortifications of Plymouth, was directed to go on to the Scillies to consult with Godolphin about the plans which the latter had sent up. Then the matter seems to have dropped temporarily, for, in May, 1593, there is a letter to the Council from some one unnamed, probably Godolphin, saying that he had yearly reminded them of the necessity for fortifying the islands, and repeating the stock arguments.² No doubt the decision of the government had already been formed, for in May Adams was instructed to build a fort and two sconces on St. Mary's, the choice of situation and other details being left to him and Godolphin, but the queen expected the islanders to give labour free of cost. The estimated expense of the building, afterwards to be known as Star Castle, was £400; the summer garrison was to consist of three gunners and twenty-six soldiers, but only ten in winter. Experiments with beacon fires on St. Mary's showed that they could be seen from the Land's End, and it was ordered that there should be always a hundred men ready to go across.³ In 1594 the fear of invasion ran high, although in reality Philip was so helpless at sea that a small English squadron was unmolested in its support of the army which attacked the Spanish fort newly built at the entrance of Brest harbour. An event occurred in July, 1595, which seemed to justify Elizabeth's terrors, when four Spanish galleys dashed over from Blavet, in Brittany, landed men in Mount's Bay, and burnt Newlyn, Mousehole, and Penzance. The crews held a thanksgiving service on the western hill at Penzance, and vowed to build a friary there when England was conquered.⁴ Raids are always possible, however strong may be the dominant navy, and at this very time there was a powerful fleet at Plymouth nearly ready to sail under Drake and Hawkins on their ill-fated West Indian voyage. The two admirals hastened round with ships, while the authorities raised the county levies; but the enterprise was never meant to be anything more than bravado, and before the leaders reached the spot the Spaniards had scuttled back to Blavet. It was said that 400 men were landed at Mount's Bay, but to those who know the carrying capacity of four galleys the number is an obvious exaggeration. At the time it was considered that a better resistance might have been made by the inhabitants, although a report of this period by Sir Thomas Baskerville, on the defence of Cornwall, remarked on the paucity of arms and munition because so much had been taken to sea.⁵ In fact the conduct of the Penzance people gave birth to a local proverb, 'Not a word of Penzance,' and the Council regarded the deficiencies in the defence as a 'foul disorder,' although they authorized a collection for the sufferers. When the news came to John Killigrew he summoned the neighbouring parishes to send in their men to Pendennis, but seems to have continued the practice unnecessarily, 'for a kind of glory to himself,' wrote the townsmen of Penryn, and he was sharply censured by the Council in consequence.⁶ Incidentally the event produced a statement that news from Brittany was heard at Fowey sooner than anywhere else by reason of 'our common intercourse of merchandise.'⁷ On 14 March, 1595-6, a Spanish pinnace ran into Cawsand Bay and landed a few men who fired some houses, but an alarm being raised they fled to their ship.⁸ Cornwall thus had the honour of receiving the only two Spanish invasions of England, such as they were, that were effected in the course of the Elizabethan war.

Towards the end of 1595 preparations were being made for the Cadiz voyage of the following year, and Cornwall was required to find one ship.⁹ In October, 1597, a Spanish fleet having 8,000 troops on board left Coruña with the purpose of taking Pendennis and holding it as a base for invasion. While they were at sea the earl of Essex was homeward bound from the Azores with a large fleet, but a north-east gale arose which scattered both the English and Spanish ships, and it was not until the Spanish admiral was back in Spain that the enemy's design was known in England. Most of the Spanish ships were driven out far to the westward, and some, in a disabled state, made what ports they could, one coming into St. Ives. Raleigh, on his return with Essex, had taken charge of the county levies, and put 500 men into Pendennis, but a knowledge of the project that had failed led to the resolution to strengthen the castle considerably. The Spanish scheme had been a futile one at the best, but Elizabethan politicians knew as little of the possibilities or impossibilities of sea war as does the ordinary politician of to-day. John Killigrew was succeeded by Sir Nicholas Parker, who when he took charge found only one serviceable gun.¹⁰ Paul Ivey, a military engineer, was sent down to consult with Raleigh, Parker, and Sir Ferdinando Gorges about choosing a site where new fortifications might be built to command the harbour, and Helford was

¹ *Acts of P. C.* 16 May, 14 June, 29 July, 1591.

² *Hist. MSS. Com.* (Cecil MSS.) 8 Mar. 1592-3.

³ *Acts of P. C.* 11 May, 19 July, 1593: S. P. Dom. Eliz. ccxlv, 4. The castle was completed in Dec. 1594, and cost £958 (*ibid.* ccli, 56).

⁴ *Ibid.* ccliii, 33. They were in Mount's Bay 23-25 July.

⁵ Cott. MS. Otho E. xi, f. 230.

⁶ *Acts of P. C.* 11 Jan. 1595-6. He had previously reported that 400 men might be collected in less than three hours (S. P. Dom. Eliz. ccxl, 113).

⁷ *Hist. MSS. Com.* (Cecil MSS.) 14 Aug. 1595. Thos. Treffry to Cecil. He offered to procure news.

⁸ S. P. Dom. Eliz. cclvi, 89.

⁹ *Acts of P. C.* 21 Dec. 1595.

¹⁰ S. P. Dom. Eliz. cclxv, 74.

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also to be considered. Nothing, however, was done at Helford, and the additions at Pendennis were confined to enlarging the existing castle by enclosing an *enceinte* with curtains, bastions, and perhaps advanced entrenchments.¹ The sum of £1,000 was allowed for the works, and the queen was very angry when more money was required, reprimanding Parker for taking in 50 acres of ground more than was intended.² Nothing was said of St. Mawes, and it seems to have been regarded as hardly capable of defence.³ In 1599 there was another acute alarm of invasion, although no Spanish fleet was ever nearer to England than Coruña, and on 27 July the authorities in Cornwall were ordered to press all seamen between 16 and 60 years of age, and the mayor of Penryn was asked to hire a pinnace to scout on the Spanish coast for some weeks. This, practically, marks the end of the war, so far as any fears were felt in England or any further call made upon the English counties.

English seamen and shipowners had indulged for nearly half a century in a Saturnalia of piracy and privateering for their own profit; by the time the law had made itself felt and they were becoming more orderly at sea they found that others had learned their game, and were playing it at their expense, when they would fain have had peace. The Spanish government had always hesitated about issuing letters of marque, and permission several times given to its subjects had been in each case speedily withdrawn. The governors of the Low Countries showed no such indecision, and as Dunkirk, Sluys, Nieuport, and Ostend fell into their hands they became privateer bases that inflicted terrible injury upon English commerce. In 1601 the subject was sufficiently important to be debated in Parliament, when it was said that Dunkirk alone, having begun with two, had then twenty privateers at work. A year earlier Fowey and Looe were especially suffering at their hands,⁴ and one Dunkirker had taken four vessels off the Lizard in a single day, two of which belonged to Looe and Fowey;⁵ a little later five of them were known to be cruising regularly on the coast. The plague grew worse after the peace with Spain, when there was no excuse for retaliation, and if it was ameliorated during the truce between the Dutch and the Spaniards it recurred with tenfold fury when the Thirty Years' War broke out, to be followed by our own wars with France and Spain between 1625–30. Moreover the distress was intensified by the appearance in the western Channel of Algerine and Salee pirates, who had come there under the guidance of Dutchmen and of English outlaws. In 1625 Penzance petitioned for a fort because 'of late terribly terrified by the Turks,' and about the same time there were said to be thirty Saleemen off Scilly.⁶ On 12 August, 1625, the mayor of Plymouth wrote to the Council that within ten days twenty-seven vessels and 200 men, of whom eighty belonged to Looe, had been taken by them;⁷ and a few weeks before sixty men, women, and children had been taken out of a church in Mount's Bay or Mevagissey Bay by a landing party.⁸ In March, 1626, there were six Dunkirkers off Pendennis, but there was not a gun mounted nor a pound of shot in the castle, and the garrison had been unpaid for two years.⁹ Not long after came the news that Scilly had been taken by them, and that such a feat should have been thought possible shows how thoroughly the Flemish privateers had obtained the upper hand. The country people must have pursued their ancient industry with a yet keener enjoyment when a privateer was driven ashore, and to one such they 'came thick with their axes and other tools.' In 1630 the Lord Treasurer was informed that 'Egypt was never more infested with caterpillars than the Land's End with Biscayners,' but the Mohammedan pirates impressed the imagination more as messengers of life-long slavery and torture. Occasionally a Saleeman caught a Tartar. A Looe ship having been taken, the crew retook her, killing those on deck, shutting down thirty-two men under hatches, and brought the vessel into St. Ives;¹⁰ but on the whole the effect was to blockade the Cornish ports so that even fishermen dared not go out.¹¹ Neither time nor the personal government of Charles brought a remedy; in 1636 the Mediterranean pirates could be sighted daily from the shore, and Looe was again an especial sufferer, fifteen fishing boats belonging to that town and to Helford having been taken within a month.¹² Many other illustrations could be given did space permit, and it may be said that the Saleemen were not swept out of the Channel, nor the Dunkirkers suppressed, until the enormously increased and well-administered Commonwealth navy enabled the government to police home waters systematically.

¹ S. P. Dom. Eliz. cclxv, 75.

² *Acts of P. C.* 20 Nov. 1597; 23 Jan. 30 April, 1598.

³ S. P. Dom. Eliz. cclxxii, 48.

⁴ *Ibid.* cclxxv, 139.

⁵ *Hist. MSS. Com.* (Cecil MSS.) 12 April, 14 October, 1600.

⁶ S. P. Dom. Chas. I, iii, 7; xiv, 5.

⁷ *Ibid.* iv, 36.

⁸ *Ibid.* v, 81. 'A church at Minnigeesa in Mount's Bay.'

⁹ *Ibid.* xxii, 97; xxv, 105. This last paper says that there had been no guns for nine years, and that the garrison had lived on limpets and the charity of Sir John Killigrew.

¹⁰ *Ibid.* xxvii, 54. The master was probably Wm. Harrys.

¹¹ *Ibid.* Killigrew to Nicholas, 8 July, 1626.

¹² S. P. Dom. Chas. I, cccxxviii, 12, 62; Justices of Cornwall to the king.

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Notwithstanding these checks to commerce there are sundry signs of its progress during the reign of James I. Thirteen vessels of Fowey, five of Helford, two of Looe, and twelve of Saltash, besides single ones of other places, are mentioned in various official and legal papers of 1603–25.¹ There was also some privateering. In 1525 letters of marque were taken out for a ship of Fowey and for another of Looe; in 1628 for ships of Fowey, Scilly, Saltash, and Falmouth, those from the last town being of 150 and 160 tons, and the Falmouth vessels were again at sea in 1630.² Fowey sent out the *Spark* of 100 tons and the *Trial* of 150 tons, and Saltash the *Fortune* of 100 tons. In 1625, in consequence of the war with Spain and the constant use made of the harbours opening into Plymouth Sound, there was an intention of founding a dockyard at Saltash, and a survey was made of a suitable site, but the poverty of the government forbade the execution of the project.³ The maritime traffic was probably chiefly coastal and cross-channel, although Falmouth must always have been a port of refuge, but there was sufficient commercial enterprise to make it to some one's interest to propose the construction of a harbour at Porthleven, 'the most dangerous place in England, and where £100,000 and many lives have been lost in the last fifteen months.' The projector of this scheme desired to be entitled to charge sixpence a ton from all ships using it, and a toll of a penny on those passing the Land's End.⁴ This paper is probably of 1620, for about 1619 a Spanish ship with silver on board, which must have formed part of the large sum of £100,000, was wrecked on the Lizard, and the dwellers there, with Sir John Killigrew at their head, set about recovering it, threatening death to anyone who interfered.⁵ In 1629 a Dutch diver, Jacob Johnson, who had a patent apparatus, thought he would attempt some salvage on this wreck, but was prevented by the people. In view of the local hopes and prejudices a refuge harbour at Porthleven would have been very distasteful to those at hand. When Johnson was driven away a French privateer came ashore; four eccentric persons took possession of her in the king's name, but were speedily frightened away by the countrymen, who left little of the ship.⁶ A few years later, in February, 1634–5, a vessel was lost in Gwavas Lake; some of the gentlemen at hand attempted to save the cargo, but were 'opposed by a riotous multitude . . . by violence threatening the death,' and the upholders of the law had to leap down the cliffs to save their lives.⁷ It must be remembered that only the more important cases of wreck reached the cognizance of the government or of the Admiralty Court; there must have been hundreds, perhaps thousands, of instances of plunder that have left no record.

The renewal of war in 1625 led to returns of men and ships being made again from the maritime counties. That for Cornwall was compiled in August, 1626,⁸ showing 1,535 men; this, as might have been expected, shows a retrogression from the Elizabethan period. Of the total 244 lived in North Cornwall, and 76 of them belonged to St. Ives; in South Cornwall, Millbrook and Maker had 101 men, East and West Looe 80, Fowey 52, and Saltash 95. There could have been but little oversea trade at this time, for one ship of 200 tons belonging to Saltash, one of 130 and two of 120 to Millbrook, and one of 180 and one of 140 to Penryn, are the only comparatively large vessels. In 1634 the conditions were much the same, South Cornwall possessing six ships of from 120 to 200 tons, with forty-eight of 90 tons and under, and North Cornwall ten, not exceeding 45 tons; of men there were 1,124 in South and 242 in North Cornwall.⁹ The glory of Fowey had departed; 'it hath now lost the lustre of its former greatness by reason of the great piracies, spoils, and decays it hath often sustained.'¹⁰ The war of 1625 caused fears for its safety, and the deputy-lieutenants of Cornwall petitioned that it was quite unfortified and open to any foray; in January, 1626, there is a reference to the building of a fort there.¹¹ In 1633 St. Ives petitioned for some defence. The townsmen described it as the safest harbour between Bristol and the Land's End, and boasted that as many as forty vessels at a time had sheltered within the pier. A platform and works already existed, and six guns and two resident gunners were asked for.¹²

The peaceful reign of James I required little naval expenditure, and no call was made upon private resources until the preparation of Sir Robert Mansell's fleet intended to act against Algiers; of this the king thought the trading ports, as chiefly interested, should bear most of the expense. A circular letter from the Privy Council, in February, 1618–19, related that the Algerine and Tunisian pirates had taken 300 ships and many hundreds of men in a few years,¹³ but in reality the

¹ R. G. Marsden in *Trans. Roy. Hist. Soc.* xix, 336. Mr. Marsden informs me that the corresponding figures for the period 1509–58 are Fowey eleven, Looe four, and Saltash eight.

² S. P. Dom. Chas. I, cxxxv, 79.

³ Ibid. ix, 34; Coke MS. 2 Nov. 1625.

⁴ S. P. Dom. Jas. I, cxc, 8 (undated).

⁵ Ibid. cxliii, 11.

⁶ S. P. Dom. Chas. I, cxxxvi, 17.

⁷ Ibid. cclxxxiii, 20, 21, ii; Admir. Ct. Misc. Bdles. ser. ii, 241.

⁸ S. P. Dom. Chas. I, xxxiii, 70, i.

⁹ Ibid. cclxxx, 64; cclxxxii, 135.

¹⁰ Ibid. xii, 78; 29 Dec. 1625.

¹¹ Ibid. xix, 22.

¹² Ibid. cclvii, 128.

¹³ S. P. Dom. Jas. I, cv, 88. It was said in 1625 that there were 1,200 or 1,400 English prisoners at Salee, mostly taken within a few miles of the coast from Dartmouth westward (*Hist. MSS. Com. Rep.* viii, App. i, 242).

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expedition was more immediately occasioned by European politics than by the sufferings of James's subjects. No place in Cornwall was summoned to aid directly, but Plymouth was assessed at £1,000, of which two-thirds was to be furnished by Cornwall; and of this two-thirds £300 were to be by Truro, described as one of the wealthiest ports of the west. On 20 June, 1620, the mayor of Plymouth complained that only £100 could be raised in the county, and of this only £10 from Truro, where all but two of the inhabitants had refused to subscribe, and that Penryn was equally reluctant.¹ The Privy Council commented on this that the western ports had lamented the loudest about their sufferings from the Algerines, and that they were now more backward than other parts of the country that had suffered less. On their side the Truro burgesses declared that only one 20-ton vessel was owned in the town and no fishing boats; eventually, after many attempts at evasion, Truro was obliged to give substantial assistance. There were many armed merchantmen and transports in the Cadiz fleet of 1625 and the succeeding ones of 1627-8, but only in the earl of Lindsey's voyage in 1628 for the relief of Rochelle do we find a vessel of Falmouth and another of Looe.

In 1626 Charles, on the brink of war with France, resolved to follow the precedents of Elizabeth's reign, and called upon the maritime shires for fifty-six ships to join the royal fleets, each ship to be of 200 tons and victualled and fitted for three months' service. Falmouth 'with that part of Cornwall' was required to equip one ship, and Plymouth and its members two.² The time had not yet come for refusal, but nearly all the coast towns protested loudly and did their best to shift the burden to their neighbours. The burgesses of Falmouth asserted their inability because all their shipping was embargoed in France,³ and those of Truro wrote indignantly that only Penryn and Penzance had acceded to their application for assistance;⁴ they added that all the ports were poor, which may have been true, and that there was no vessel of more than 50 tons owned in the county, which we know was not true. The government recognized that the cost of equipping proper fighting ships was now too heavy to be borne alone by the coast towns, or even by the coast counties, and in 1628 Charles, instead of facing Parliament, attempted a general ship-money levy over all England. Startled by the feeling aroused, and less pressed by necessity than in later years, he withdrew from the first trial. On 20 October, 1634, there was an issue of writs, but only to seaports or towns connected with the sea; Saltash, East and West Looe, Truro, Penryn, and Padstow, were required to provide a 400-ton ship, victualled, manned, armed, and stored complete for a service of twenty-six weeks. As the ships ordered were larger than any possessed by most of the ports it was provided that an equivalent in money might be paid to the Treasury to be applied to the equipment of a king's ship, and the Cornish towns were therefore given the option of paying £2,204.⁵ The writs of 4 August, 1635, were general to the whole country, and Cornwall was assessed at one ship of 650 tons with 260 men;⁶ in October, 1636, it was called upon for a vessel of 550 tons or £5,500.⁷ The third writ was of 9 October, 1636, and was similar to its predecessor; the next writ, of January, 1639, was for a much smaller amount, and very little of it was collected; the highest assessments were for Truro and Padstow of £70 each, and £40 for Saltash.⁸ There was more or less opposition, active or passive, in all the counties, and the discontent showed itself in Cornwall. In 1637 the magistrates reported to the Council that every obstacle was being put in their way,⁹ and by 1639 even the parish constables had become refractory, 'although threatened that they would have to make good the rates of their parishes.'¹⁰

During the seventeenth century it became almost a profession in certain families to petition for a licence to erect a lighthouse, with the right to exact tolls to be collected by the customs officers. With the growth of commerce huge sums of money were levied under these patents, and very indifferent service was rendered in return. Probably the earliest Cornish light was that in a cresset on one of the turrets of the house at St. Michael's Mount, for the maintenance of which Sir John Arundel bequeathed 13s. 4d. in 1433.¹¹ The Killigrews, who had much of the instinct of the modern financial magnate, were among the first to appreciate the possibilities of the new speculation, and as early as 1570 Sir John Killigrew obtained a patent from the Lord Admiral authorizing him to erect a lighthouse on the Lizard.¹² Nothing came of this, and by 1619, choice of occupation having become restricted, the then Sir John, bethinking himself of a new source of income, remembered the scheme. Philanthropy was the avowed motive in erecting a lighthouse, towards the support of which he only asked voluntary contributions, but the real intention was to

¹ S. P. Dom. Jas. I, cxiii, 63; cxv, 97; *Trans. Devon Assoc.* xx, 314.

² S. P. Dom. Chas. I, xxx, 81. The 'members' of Plymouth consisted of all the ports of Cornwall (*Ibid.* lxi, 28; xliii, 41), so that the county, or part of it, was taxed twice over by this demand.

³ *Ibid.* liii, 26.

⁴ *Ibid.* lxi, 28

⁵ *Ibid.* cclxxvi, 1, 64; Rushworth (ed. 1708), ii, 257.

⁶ S. P. Dom. Chas. I, ccxcvi, 69.

⁷ *Ibid.* cccxxxiii, 61.

⁸ *Ibid.* cccci, 37.

⁹ *Ibid.* cccxvi, 88.

¹⁰ *Ibid.* cccxxiv, 43.

¹¹ *Western Antiquary*, iv, 252.

¹² *Admir. Ct. Misc.* 1, 130.

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get a grant of a fixed imposition on shipping when certificates of its utility were obtained. This, he thought, would be easy.¹ He was taken at his word and given a similar patent to that of 1570, permitting him to build the lighthouse and to keep the light burning for fifty years.² With a staid, if unintentional, humour it gave him leave to receive any contributions voluntarily offered to him, as he was doing the work 'out of Christian and charitable considerations.' Then Killigrew's troubles began. By December, 1619, the tower was built and the light was burning, at a cost of 10 shillings a night for coal. Not only was the light burning, but so also were his neighbours, who declared,

that I take away God's grace from them; their English meaning is that they now shall receive no more benefit from shipwreck. They have been so long used to reap purchase by the calamity of the ruin of shipping as they claim it hereditary.³

When Killigrew petitioned for his patent from the Lord Admiral he had entered into a secret agreement with Sir Dudley Carleton, our ambassador at the Hague, by which Carleton was to have half of all profits accruing from the light.⁴ Carleton was to earn this by using his influence in England to get a real patent from the crown empowering Killigrew to levy a fixed duty on English shipping, and his influence in Holland to obtain a similar grant on Dutch shipping passing the Lizard. These schemes both failed. Notwithstanding Carleton's pressure, the Dutch contributed nothing, although certificates from Dutch skippers attesting the utility of the light were not wanting, and although Dutch shipping to the value of £100,000 had been lost upon the Lizard within ten years. At home there was active opposition led by the Trinity House, who objected to it, nominally, because they pretended to think it not only needless, but a guide to pirates and enemies;⁵ really, because it would not be under their control and would not be worked for their profit—'the Trinity House, who have grown insolent, oppose a patent, pretending that all lights and sea-marks belong to them.'⁶ In January, 1620, Killigrew made his moan to Carleton that he had spent £500 without any return, and in May he had almost decided to extinguish the light, but would venture another £50 in coal, in hope of an arrangement with the Dutch.⁷ Apparently it flickered out, for nothing more is heard of it until 1622, when Sir John made another and more successful attempt. Wisely, he gave an interest in the profits to Robert Mynne, a brother-in-law of Sir George Calvert, Secretary of State, and with this powerful influence at work he had no difficulty in obtaining his patent.⁸ It recites that Killigrew, having built a suitable tower of stone and lime, should receive, subject to a yearly rental of forty shillings reserved to the crown, a halfpenny a ton on all vessels, except fishing boats, passing the Lizard; of this a farthing was laid on the ship's tonnage and a farthing on the cargo, and the duty was to be collected by the customs officers at the various ports. The opposition of the Trinity House seemed to be nullified by a clause asserting the power inherent in the crown to grant such a licence notwithstanding any rights of the corporation under the statute 8 Eliz. c. 5. A final reservation on the part of the crown was the faculty of revoking the patent if it were found to be burdensome to the shipping interest; upon any declaration to that effect 'this grant immediately becomes void.' If Killigrew thought that the patent would put an end to his disappointments, he soon found out his mistake. The outcries of shipowners who objected to pay, of customs officers who did not want the trouble of collecting, of the neighbouring ports which would feel the tax the most heavily, and, above all, of the Trinity Brethren, who fought for their profits and privileges, became fiercer than ever; and, although the Trinity House itself did not estimate the charge at more than £400 a year,⁹ the opposition was finally successful.¹⁰

In 1631 Sir William Killigrew tried, through Carleton, to obtain a new patent, but without success,¹¹ and then the Killigrews seem to have abandoned the enterprise. After the Restoration there was a rush for lighthouse patents. Captain Edward Penruddocke was the first applicant, in 1661, for the Lizard,¹² and then followed Sir John Coryton in 1664, who petitioned for the Lizard, Falmouth, Rame Head, Torbay, Dartmouth, Portland, and the Isle of Wight, no doubt in the hope of a grant of at least one of them, and who boasted his influence with the duke of York, who 'has never yet denied him anything.'¹³ In 1665 Coryton and Henry Brouncker petitioned for a licence for the Eddystone and the Scillies; these petitions were then, as always, referred to the Trinity House, who invariably reported on them adversely, not for obvious reasons of public policy, but as

¹ S. P. Dom. Jas. I, cix, 42. At this time homeward bound vessels sought to make the Bolt as their landfall.

² Admir. Ct. Misc. Bdles. 160. The patent was dated 29 June, 1619.

³ S. P. Dom. Jas. I, cx, 61. Most of the houses about the Lizard were built of wreck timber (*Ibid.* cxv, 3).

⁴ *Ibid.* Add. xli, 113. ⁵ *Hist. MSS. Com. Rep.* viii, App. i, 239. ⁶ S. P. Dom. Jas. I, cxii, 90.

⁷ *Ibid.* 111; cxv, 3. ⁸ Pat. 11 Dec. 1622. ⁹ S. P. Dom. Jas. I, clv, 1.

¹⁰ *Ibid.* Chas. I, clxxxii, 63. There is an entry in the Plymouth Corp. MSS. of the money 'disburst for the putting down of the Lizard light' (*Hist. MSS. Com. Rep.* x, App. iv, 540).

¹¹ S. P. Dom. Chas. I, clxxxii, 63.

¹² *Hist. MSS. Com. Rep.* viii, App. i, 250.

¹³ *Ibid.* 252; S. P. Dom. Chas. II, clxxxviii, 10.

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jealous trade rivals. Sir John was already a large proprietor in lighthouses, and offered to surrender a licence for four on the east coast if he should be allowed to erect one at the Scillies, but the Trinity House had already pre-empted that station from the king. Probably intending speculators realized that there was no hope of a licence for the Lizard except under an arrangement with the Trinity House, and there is no trace of any further application until 1748. In that year Thomas Fonnereau came to an agreement with the corporation by which on erecting a tower, the predecessor of the present eastern tower, with four turrets to show the light from four coal fires, he was to hold the lease, at £80 a year rent, for sixty-one years, at the expiration of which term the Trinity House would come into possession. The patent is dated 22 May, 1751, and the light was first shown on 22 August, 1752;¹ on 16 January, 1812, the coal fire was superseded by oil, and in 1878 oil by electricity.

The indefatigable Sir John Coryton had in 1665 made proposals in vain for a lighthouse on the Scillies; the Trinity House, supported by the East India Company, obtained an Order in Council of 24 June, 1680, for that station.² They immediately sent two of the Elder Brethren to consult with Sir Francis Godolphin as to the most suitable place, and St. Agnes was selected. On 16 October a circular letter was directed to merchants in Spain, Portugal, and the Mediterranean, stating that the fire would be lit on the 30th instant, the toll being a halfpenny a ton on English, and a penny on foreign ships, each way. The commencement was not auspicious, for in December a Virginian trader was lost on the reefs, and the lighthouse keeper, one Hoskins, was found to have been neglectful or worse, and to have stolen what part of the cargo he could come at.³ There were other troubles also; the Isle of Wight shipowners strongly objected to paying for a Scilly light, talked of forming a 'club' to refuse payment, and a further Order in Council was necessary to enforce the payment of the dues. Then the Trinity House became involved in a lawsuit with one Purnock, who seems to have claimed a prior grant, and with some justice, as an Order in Council of 16 May, 1683, ordered the corporation to pay him twenty shillings yearly during his term. The history of the St. Agnes light is for a long time one of suspicion of negligence and connivance with wreckers on the part of the keepers, and of complaints of the dimness of the fire. Heath, who wrote his account of the Scillies in 1750, says that he had known the fire to be not even lit, and, if lit, often not to be seen from St. Mary's. This can have been no occasional occurrence, for in 1716 the light was so well known to be untrustworthy that William Whiston proposed that 'a ball of fire' should be thrown up from a mortar four times a night in its place.⁴ In 1790 St. Agnes was made a revolving oil light, and the original tower is still in use.

The Trinity House obtained a patent for the Longships, dated 30 June, 1791, entitling them to charge a halfpenny and a penny a ton respectively on British and foreign shipping passing it. On 29 September, 1795, they granted a lease of it to Lieutenant Henry Smith for fifty years at a rent of £100 a year. The average profits drawn from the light for 1819-21 were £3,017 a year net. In 1822 it was the subject of a chancery suit, and in consequence of the strictures of parliamentary committees on the bad policy of granting leases, the Trinity House offered, in 1825, to purchase the remainder of the term, but the lessees refused then to sell. In 1836, however, the interest in the nine and a half years yet to run was bought for £40,696. The Longships, rebuilt in 1873, was converted in 1883 into an occulting light.⁵ The Sevenstones is marked by a lightship which was established in September, 1841, and the first vessel stationed there pitched so fearfully in the heavy seas off the Land's End that the master was once thrown from the tiller clean over the companion. The first attempt at a lighthouse on the Bishop Rock was washed away on the night of 6 February, 1850, and the present structure, built from the plans of Mr. James Walker, was established in 1858. The situation is one of the most exposed in the world to pounding seas, and spray has been known often to go over the old light 110 ft. above high-water mark. It was constructed of solid granite to 45 ft. above high water, but cracks developed in this, and it was encased in masonry in 1886, the tower, carrying a four-second flash light, being at the same time raised to 183 ft. The first beacon on the Wolf Rock was put up in 1795. That and its successors were carried away after lives of varying but short duration. The last one, finished in 1840 at a cost of £11,298, consisted only of a cone of masonry with a mast and globe of iron painted red; it took five years in building, during which period only 302½ working hours could be obtained. Although so expensive,

¹ *Parl. Papers* (1834), xii, 351.

² Orders in Council; *Hist. MSS. Com. Rep.* viii, App. i, 257, 261. The *Phenix*, East Indiaman, had been lost recently on the islands.

³ This was considered a deliberate case of wrecking, the fire not being lit until the ship was on the rocks. The Trinity House ordered that no Cornishman was to be employed at St. Agnes (Hardy, *British Lighthouses*, p. 196).

⁴ Heath, p. 160.

⁵ *Parl. Papers* (1822) xxi, 497; (1834) xii, 37; (1845), ix, 6. The lantern of the old lighthouse was 79 ft. above high-water mark, but seas have been known to lift the cowl and extinguish several of the lamps, and the light was often obscured by the seas (*Ibid.* (1861), xxv, 72). In connexion with this light, James Cobb's story, *The Watchers on the Longships*, said to be based on facts, should be read.

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this beacon cannot have been very visible, for in 1856 a man-of-war reported it to have disappeared although it proved to be still in place. The lighthouse, close to the beacon, designed by Sir J. N. Douglass, occupied seven years (1862-9) in construction, but the difficulty of the task may be realized from the fact that only thirty-eight hours' work could be done upon the rock during the first year. A lighthouse on Trevoze Head was under consideration in 1809, 1813, and 1832, but was not lit until 1 December, 1847. Godrevy, intended to mark the dangerous Stones Rocks, took the form at first of a lightship between 20 March, 1858, and 1 March, 1859, when the lighthouse was completed. The lighthouse on Round Island (Scillies) was established in 1887.¹

The minor Cornish lights are : Penzance Pier, first shown 16 November, 1816 ; St. Anthony, Falmouth, 20 April, 1835 ; Falmouth Breakwater, 1860 ; Fowey (White House Point), 1875 ;² Padstow, 1868 ;³ St. Ives Pier, 1777, New Pier, 1894 ; St. Mary's (Pier), Scillies, 1898 ; Mousehole Pier, 1896 ; Newlyn South Pier, 1887, North Pier, 1898 ; Porthleven Pier, 1883 ; Porthmellin (West) Pier, 1895 ; Polperro (West) Pier, 1897 ; Looe Pier, 1899 ; Mevagissey Breakwater, 1889 ; Hayle, 1840 ; and Pendeen, 1900.

Closely related to the story of coast lighting is that of beaconage, buoys, and sea-marks, but the early history is obscure. Appointments as 'beaconers' were in the gift of the Lord Admiral, and, as tolls of some value were attached to the posts, the beaconage of ports, rivers, and coasts was, in early times, usually leased either as a favour or under payment of rent. Ralph Cleyton was granted the privilege of beaconage between Dartmouth and Falmouth by patent of 19 October, 1567.⁴ On 25 April, 1586, the Lord Admiral Howard directed a patent to be renewed in favour of David Morgan for the beaconage of Falmouth, Plymouth, and Dartmouth.⁵ In 1587 the right to place beacons and buoys on the coasts of Devon and Cornwall was granted to Patrick Bleares, Howard's chaplain ; but in 1594 the Trinity House obtained the Lord Admiral's prerogative in these matters. For a long time, however, the rights of the Trinity House were shadowy and not unquestioned. In 1619 we find Sir Francis Godolphin obtaining sentence from the Admiralty Court in his favour, and against the Lord Admiral, on his claim to beaconage and buoyage in Falmouth and Helford under his lease from the bishop of Exeter. To this suit the Trinity House was not a party, and it is not clear what were the bishop's rights and powers in the matter of beaconage. Probably a mark existed on the Black Rock at Falmouth in very early times, but the first Cornish sea-mark of which the exact date is known is the tower on St. Martin's Island, built by Thomas Ekins in 1683.⁶ When Heath wrote in 1750, there was a beacon on the Black Rock, and as he tells us that ships were charged a shilling for it by an Act of Charles II it may be presumed to be of that reign, but there is some reason to suppose that the toll was originally levied by Truro and goes back to a far-off antiquity.⁷ There was a beacon on the Dodman during part of the eighteenth century.

During the reign of Charles I the maintenance of the coast fortifications had been generally neglected. Pendennis had some serviceable armament, which the governor employed in firing at English men-of-war if they failed to salute the castle when entering or leaving the haven ;⁸ but at St. Mawes the captain, Sir Robert Le Grys, had burnt the gun carriages for firewood.⁹ As well as neglect the common evil of dishonesty was at work ; in 1636 the Council ordered a reward to be paid to a man who had traced 130 tons of ordnance as having been clandestinely removed from various forts. In the Scillies the fortification on Tresco, built by Edward VI, was disused ; the castle at St. Mary's was incapable of defence in 1637, and although since 1628 there had been a garrison of 125 men, they lived anywhere in the island, because Star Castle could not accommodate twenty of them.¹⁰ As the political situation became more strained some attention was given to repairing and re-arming the forts, but as Cornwall was mainly royalist the gentlemen of the county took care that there should be no danger of surprise. All the more considerable English ports, the worst sufferers by Charles's naval maladministration, stood for the Parliament, and even in Cornwall the coast towns were mostly neutral, if not rebellious, while Penryn and St. Ives were definitely on the side of the Parliament. In 1644 the county became the scene of a disastrous reverse, in the surrender of Essex's army at Fowey on 2 September, plainly due to the insufficiency of force at the disposal of the Parliamentary admiral. Essex, outnumbered and driven back to the coast by the

¹ Geographically the Eddystone belongs to Cornwall, but as it has always been built and worked from Plymouth it is dealt with in the 'Maritime History of Devonshire.'

² For many years the Fowey people troubled the Trinity House in vain. They complained in 1861 that the corporation of Lostwithiel received dues 'but does nothing else' (*Parl. Papers* (1861), xxv, 636).

³ Preceded by a beacon half a mile west of Stepper Point placed by local subscription.

⁴ Admir. Ct. Inq. i.

⁵ Ibid. v.

⁶ Borlase, *Observations*, p. 54.

⁷ See App. B for the list of the Cornish buoys and beacons.

⁸ S. P. Dom. Chas. I, cci, 59 ; cciii, 71.

⁹ Ibid. cclxxiii, 16.

¹⁰ Ibid. cclxviii, 110. This report says that there were not more than thirty inhabitants capable of bearing arms.

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king, could have conveyed away his men by sea had there been any ships to receive them, for Charles had not then, nor at any time, a fleet, and the fort at Polruan, held by the royalists, could have been silenced in an hour by a 40-gun ship. But the Parliamentary admiral, the earl of Warwick, had only some eight vessels, and was busily engaged off the coasts of Dorsetshire and Devonshire, nor had the belated efforts of the authorities in London to reinforce him been successful. On 14 July, 1644, when Henrietta Maria left Falmouth, there were only three ships, of which one was a man-of-war, watching the port, and this small squadron was unable to do more than exchange a few shots with the ten or twelve vessels escorting the queen. The great expansion of the navy that characterized this period had not yet commenced, and the part that, small as it then was, it could play, and did play, in the destruction of the royalist party was understood by few, if any, contemporaries.

Cornwall was not again the scene of important military movements until 1646, when Fairfax entered the county to meet the Prince of Wales. By that time enthusiasm for the royal cause was cooling, and the Parliamentary leader was even welcomed when it was known that a scheme was on foot to bring over French troops, and that the earl of Glamorgan was going to send over Irish soldiers. The prospect became so desperate that, after a short stay at Pendennis, Prince Charles left for the Scillies on 2 March. His advisers found St. Mary's weak militarily, almost famine stricken, and dependent on the mainland for supplies. On 12 April a Parliamentary fleet appeared off the islands, but it was driven away by bad weather, and the prince took advantage of the respite to escape, on the 16th, to Jersey. The State's ships, under Vice-admiral William Batten, reappeared a few days later, but then went back to Cornwall to blockade Pendennis, which was also besieged by land, until it surrendered on 17 August.¹ Then the Scillies were again taken in hand. Practically no resistance was made, negotiations took place at Falmouth, and the royalist commissioners were carried to and fro in a State's ship. The admiral, Sir George Ayscue, was careful to disabuse the islanders of the fear the royalist leaders had instilled into them that they were to be transported and the islands resettled, and then found them very friendly. The surrender was completed on 12 September, and, in Ayscue's opinion, if the royalists had understood their value they might have been made a second Algiers.² How they were to be an Algiers without ships, or how they were to be held without a fleet, Ayscue did not explain, and he was at the moment expounding a practical lesson entirely at variance with his theory. The year 1648 was a critical one for the new government. In May a portion of the fleet went over to the Prince of Wales and royalist hopes ran high. Ireland was aflame, a Scotch army was in England, and local risings were numerous. One of these was at Scilly, where the garrison revolted to Charles, and the accession was considered important as providing a station connecting the royalists in Holland with Ireland. Early in 1649 Prince Rupert made a dash with a few ships from Holland to Kinsale, and in March landed Irish soldiers at the Scillies to serve under the governor Sir John Grenville. Rupert expected 'ere long to see Scilly a second Venice,' but he did not know that Venices are not made by fleets too weak to do anything but run away. When Blake appeared off Kinsale Rupert had to fly for his life, and Grenville was left to his own resources. For a time—just as long as he was left alone—his resources were sufficient to do some mischief in a puny way; small privateers made the islands their headquarters, and, although not able to fight men-of-war, were destructive among coasters and small merchantmen.³ The Commonwealth navy was fully occupied elsewhere, and undue respect was felt for Grenville's capacity for defence. The affair was brought to a head by the action of the Dutch in 1651. In 1650 Charles had offered the Scillies to a syndicate of Dutch merchants as security for a loan of £50,000, and it was perhaps cause and effect that in March, 1651, Tromp appeared off the islands with a fleet, demanding reparation for the piracies committed on Dutch vessels. The Council of State at once took alarm. Representations were made at the Hague that Tromp's presence was, in the language of diplomacy, 'an unfriendly act,' and Blake was ordered to take command of Sir George Ayscue's fleet, then ready to sail for the West Indies, fight Tromp if necessary, and not leave Cornish waters until he had reduced the Scillies.⁴ Blake arrived on 15 April with upwards of twenty ships and nine companies of infantry, and we have a very lucid account of the operations from the bishop of Down, who, more clear-sighted than many of his military contemporaries, saw

¹ Raglan Castle, the last place that held out for the king, surrendered two days later. St. Mawes had yielded on 11 March; the tradition of 'Roaring Meg,' a great gun there, still lingers in the neighbourhood. A 26-gun fort on the Helford River capitulated on 18 March, and St. Michael's Mount on 15 April. Colonel John Arundel, the governor of Pendennis, was known as 'John for the King,' and as 'Old Tilbury,' the last from having been stationed at Tilbury Fort in 1588.

² *Hist. MSS. Com.* (Portland MS.) i, 392.

³ In London, where they were not likely to minimize the number, only twenty-five privateers altogether were attributed to the Scillies, Jersey, the Isle of Man, and Galloway (Whitelocke, *Memorials* (ed. 1682), 464 d).

⁴ S. P. Dom. Interreg. 1 April, 10 May, 1651; Rymer, *Foedera*, xix, 599.

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that the islands were useless while the Parliament commanded the sea.¹ Tresco was taken on the 18th, after some fighting, and batteries were thrown up to command Broad Sound; then followed some weeks of desultory fighting and negotiation until Grenville surrendered, 23 May, on condition that his soldiers should be sent back to Ireland and that the inhabitants should suffer no punishment.² Taught by experience, the Council of State was now careful in the selection of a governor for St. Mary's, as it 'has been several times very costly both in reducing it and the mischief done by it.'

The Dutch war of 1652 was sufficiently popular among the seamen, but after the volunteers had joined, and the press system came into operation, there were the usual difficulties. Each maritime district had its press master appointed who claimed the aid of the local officials, but often the constables, instead of pressing men, aided them to escape. Moreover many of the local authorities were engaged in maritime trade, and it was not to their interest to have their particular towns swept bare of men; also the spirit of freedom was in the air and the legality of the press disputed, 'the power by which we act is questioned, and whether there be any such power.' Richard Mills, press master for the western counties, was ordered not to take more than one or two men from the crew of each fishing boat, and at Fowey he had 'to fetch them out of the cliffs and rocks' with soldiers.³ The government was compelled to be tender with commercial interests, and dared not act with the high hand of an old-established monarchy. Thus while Mills was hunting in the caves, 1,500 seamen sailed in west-country ships for Newfoundland in March, and instead of them there came two months later from the western counties, to man the men-of-war, labourers and artisans who had never seen salt water.⁴ A few years earlier an embargo would have prevented all employment until the royal fleets were manned, but, except in a tentative and limited form, the expedient was too heroic for a government on its probation. In 1652 sixpence a day was allowed for the maintenance of Dutch prisoners at Falmouth, following Ayscue's action of 16 August; but the presence of strong English fleets in the Channel did not prevent Dutch privateers plying their trade, and in January, 1653, one took the packet that ran between Penzance and Scilly. Although several battles were fought not far from the Cornish coast the county was not expressly affected, except for a short time in 1667, by any of the three Dutch wars, other than by the drain of men and the check to commerce; although the enemy's privateers were more numerous in the eastern channel and on the east coast than in the west. But if other industries were checked that of wrecking still flourished, and in 1652 the Council declared, on the details of a Cornish wreck being brought before it, the horror with which was viewed 'the cruelty and inhumanity of the people inhabiting the maritime coasts.'⁵ Rounded regrets are not a remedy, and a few years later the circumstances attending the wreck of the *Aleppo Merchant* at Padstow drew angry comments on 'the dishonest and savage practices of the common people.'⁶ In 1667 a Spanish vessel was lost on the Scillies, and a passenger of rank complained of the cruelty of the Scillonians in leaving him for a day or two on a rock before taking him off, 'valuing the saving of the goods more than his life,'⁷ but in this case it is well to remember that it is not always possible, in the angry seas round the Scillies, to approach a rock upon which a lucky, but naturally impatient, survivor has scrambled or been washed up.

Whatever the former maritime importance of Cornwall it seems to have been long falling back in comparison with other counties. In 1664 a list of men available for the navy assesses it at 200, as against 150 for Somerset and 700 for Devon.⁸ Under the press system, as ridiculous as iniquitous, the expense of catching the hunted men was enormous. Every one who helped to trap them had a claim to reward, and in one instance the cost to the crown of laying hold of twenty-seven men at Falmouth and getting them to Plymouth was £67 10s.⁹ Towards the end of 1666 Charles, desirous of using, towards the formation of a standing army, the money voted by Parliament for the navy, and trusting to the peace negotiations opened at Breda, decided to put most of the men-of-war out of commission and to rely on the coast fortifications and militia to repel attack. The Dutch were eager for peace, but thought that the best way to procure it was to stimulate the plenipotentiaries by acts of war, and when news came to London that the Dutch fleet was going to sea a circular letter of warning was sent round the counties. In June came the attacks in the Thames and Medway. Early in July the Dutch fleet was divided, one division remained to blockade the Thames, the other, of some thirty ships under Ruyter, was ordered to sail down Channel and terrorize the south coast. Being informed that the merchant fleet from the Mediterranean was

¹ Egerton MSS. 2534, ff. 82, 86.

² Ibid. 19 May, 3 June, 1653.

³ Ibid. 13 Feb. 1652.

⁴ Ibid. Chas. II, ccxxv, 131.

⁵ Add. MS. 9,316, f. 79. The numbers cannot represent the totals of each county, but only the quotas to be raised at the time; no doubt the proportions remain the same.

⁶ Navy Board Letters, xlv.

⁷ S. P. Dom. Interreg. xv, 80.

⁸ Ibid. 14 March, 1 June, 1653.

⁹ Ibid. 1 Jan. 1658-9.

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coming up Channel, Ruyter hastened westwards, but the convoy had put into Dartmouth and the admiral did not like the look of the preparations made to receive him. He withdrew, but by moving backwards and forwards along the coasts of Devonshire and Cornwall kept them in a continual alarm. At Falmouth there was 'nothing but beating of drums and sound of trumpets,' but the martial fervour was wasted when the Dutch did not appear there. Learning from a privateer that a convoy had put into the Scillies a squadron was sent there, but found nothing in the anchorage but a dismantled wreck. St. Mary's was well fortified, 110 guns being mounted,¹ and there was nothing to be gained by an attack. Fortune seemed to offer Ruyter another opportunity when the Virginia fleet of some thirty-five or forty sail entered the Channel; he hastened to intercept it, but a fortunate gale delayed him, and the English ships, being warned, fled to various ports, the majority, some thirty in number, taking refuge in Fowey during the second week of August. Their escape was considered marvellous, and preparations were made for a strenuous defence; batteries mounting fifty guns were thrown up, fifteen companies of militia marched into the place, and boats got ready to grapple and tow off fireships.² On 15 August the Dutch appeared, and Ruyter decided to send in fireships under cover of the fire from four frigates handy enough to work close in with the shore. The wind was unfavourable, and the fireships did not even attempt to enter; only one frigate got in near enough to engage for two hours, the English boasting that the only casualty on their side was an old woman killed by its fire.³ The wind remained contrary; it was seen that the merchantmen had been towed higher up the harbour, and that a boom had been improvised across the entrance, so that there seemed to be no hope of using fireships successfully, and on 21 August⁴ Ruyter sailed away, thus ending the last attempt by a foreign fleet on a Cornish port.

In October, 1667, a Genoese ship, of the reputed value of £100,000, was lost off the Lizard; this and other losses of the kind led to applications to the crown for licences to salve wrecks, such speculations, like the fashion for lighthouse patents, being a 'humour of the times.' The treasure lost at the Lizard, and perhaps the legend of the ship of 1619,⁵ caused diving operations to be undertaken at several periods, and the locality became a favourite one for the trial of new inventions in diving. In 1704 Robert Davis, a shipbuilder of Leith, claimed that he had descended several fathoms at Polpear in his 'diving engine, and did say the Hundredth Psalm under water' at the Bumble Rocks, where bars of silver had previously been recovered, and that although other inventors had brought their machine there, none had been so successful as he.⁶ While most people tried to profit by wrecks, a few endeavoured to prevent them, and Henry Jones and Ralph Michell, an engineer, petitioned Parliament on the desirability of constructing a harbour in Whitsand Bay, at the Land's End.⁷ They proposed to build a breakwater between Cowloe Rock and the shore, thus enclosing an area sheltered from the westward. Their petitions contain some interesting information, especially as to the inability of the Scillies to supply a convoy. While Michell was writing, 120 sail, with five men-of-war, had put into the islands; but the warships, being in danger of starvation, had to run for Ireland, and when the convoy put to sea several were picked up by privateers. To show the need for a harbour the writers recall the loss of 70 out of 100 sail on the north coast of Cornwall in 1693 by a gale which shifted from east to west, the wreck of H.M.S. *Calchester* in Whitsand Bay on 16 January, 1703-4, when 170 men were drowned, and three vessels and sixty-two lives recently lost on the Land's End. It seemed to them that a further necessity was a lighthouse at the Land's End, for want of which ships sometimes ran into the Bristol instead of the English Channel, the East India fleet of 1703 having sighted Lundy before discovering the mistake.⁸ Could the writers return to life they would find that lighthouses are no panacea, and that shipmasters sometimes still fall into the same error.

The war which followed the accession of William III was largely naval, leading to a corresponding increase in the size of the navy, and consequently the existing dockyard accommodation was found to be insufficient. Plymouth had for long been a more or less permanent station and seemed to be entitled by prescription to be chosen as the locality of the new yard; although ultimately it was selected the choice was made only after some hesitation. Even then an additional dockyard was proposed, and would no doubt have been established had money been more plentiful. Plymouth was hardly in working order when the Navy Board had Falmouth in view, and in January, 1693, the possibilities of the place were reported on, but unfavourably.⁹ The subject dropped until 1698,

¹ S.P. Dom. Chas. II, ccxiii, 9; 9 Aug. 1667.

² Ibid. 123, 125, 126. Sir Thomas Allin, a good seaman, and the earl of Bath, the Lord-Lieutenant of Cornwall, were in the town (Ibid. ccxiv, 85).

³ Brandt, *Vie de Michel de Ruyter*, 433.

⁴ Ante, p. 496. ⁵ Hist. MSS. Com. Rep. xii, App. vii, 52.

⁶ Hist. MSS. Com. (Portland MS.) v, 350.

⁷ H. Jones, *Reasons for Building a Pier at Whitsand Bay*, 1702; R. Michell, *Reasons, etc.* (1704).

⁸ In 1758 the *Belliqueux*, 64, bound from Quebec to Brest, was making Lundy instead of Brest when she was captured.

⁹ Add. MS. 9,314, fol. 93; Admir. Sec. Min. ix, 21 July, 1693. There was a sufficient number of men-of-war calling to make it necessary to appoint an agent—Daniel Gwin—to report their movements to the Admiralty (Ibid. x, 2 April, 1694).

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when Edward Dummer, the Surveyor of the Navy, Captain Edward Wilshaw, a member of the Navy Board, and two Elder Brethren of the Trinity House, visited and reported on all the harbours of the south coast likely to be of use.¹ Of Fowey they wrote, 'We esteem it to serve upon urgent necessities to shelter small ships if they lie fair for it . . . but not advisable, in our opinions, to be chosen for any services for the navy.' Falmouth was definitely condemned, being 'clogged with many very inconvenient shoals and sudden soundings, and therefore not very much frequented by shipping: it was surveyed by order in the year 93, and judged not to abound in those qualifications which are proper for the improvement of the navy.' Helford was dismissed as 'small and inconsiderable for ships of war.' There was a long-lived prejudice in the old navy against both Falmouth and the Scillies, that against the latter being intensified by Shovel's disaster in 1707. Navy men usually gave the islands a wide berth; in 1810 it was estimated that not one officer in ten had ever been within three miles of them, and that the navigation of the continental coast, from Toulon to the Great Belt, was better known in the Service than that of these dreaded roadsteads.² It was proposed in that year to build a breakwater in Broad Sound to shelter ten or twelve sail of the line and 400 or 500 smaller ships, the particular advantage of the station being that vessels leaving it could weather Ushant with the wind from the westward. The cost was calculated at nearly £2,000,000, but the close of the war did away with any possibility of its adoption, especially as the want of supplies, water in particular, was one still confessed and unremedied. Falmouth was chosen in 1794 as the base for a squadron of frigates cruising in the western Channel, but it was not liked by admirals with heavy ships in their command, who found it difficult to get out with any wind from E.S.E. to W. In March, 1806, Lord St. Vincent was there with eight of the line, and found it hard to leave with the wind even at north-east by east; he wrote afterwards to the Admiralty that something would have to be done at any expense to make Plymouth a better roadstead, 'for the difficulty of getting out of Falmouth harbour in winter time is so great it cannot be depended upon.'³ Earl Spencer, who was First Lord from 1794 to 1800, disliked Falmouth as 'neither easy nor safe for large ships to go in or out of except in very favourable winds and weather';⁴ but, like most political First Lords, he was probably merely repeating the ideas of his professional colleagues, and it is only evidence of naval opinion. There was a general feeling at this time that more shelter to the westward was an immediate necessity; Falmouth, Cawsand Bay, and Torbay were all discussed; 'we must lay out a million or two of money in making artificial shelter somewhere.'⁵ Cawsand Bay was a smaller anchorage than Torbay, and, in the winter months at least, a very unsafe one, with heavy seas frequently running, so that transports and merchantmen dared not anchor there. Eventually, we know, all these indefinite schemes of improvement materialized into Plymouth Breakwater. As Falmouth was used during the French war as a cruiser and subsidiary station a certain quantity of supplies and some hospital and depot ships were kept in the port. By an order of 12 July, 1814, the naval establishment there was closed, everything being removed to Plymouth.⁶

The maritime history of Cornwall in modern times ceases to be of interest from a military point of view. Its situation was too remote to be of use to an invader in his principal object, and the powerful fleets kept in commission had terminated the era of plunder raids. There were evanescent alarms of Jacobite or other invasion, and the ports often saw privateers. In 1692 Padstow was blockaded by them, five coasters being taken in one day in sight of the port;⁷ the navy was never sufficiently large nor ubiquitous to keep the coasts quite clear. In 1756 a French privateer, hampered by an adverse wind, tried for three days to land 200 men in Mount's Bay, but she waited too long and was taken by H.M.S. *Tartar*. In 1760 Penzance had another alarm and the volunteer company turned out, but the strange vessel proved to be an Algerine, and on inquiry it was found that the captain thought himself to be in the Atlantic and making Cadiz.⁸ However, the local defences were never tested seriously. In 1716 there was a survey of the coast fortifications generally; when Star Castle was found to be in fair condition, the ancient castle at Tresco was still capable of carrying six guns, and there were many other batteries, with, altogether, 120 guns, but mostly dismounted or on rotting carriages. Pendennis, in a bad state, had ninety-seven guns, and St. Mawes, in good repair, eighteen.⁹ It being held that the forts were all over-gunned, from the standpoint of continental military science, sweeping reductions were ordered,

¹ Sloane MS. 3,233.

² Tucker, *Report . . . concerning . . . the Islands of Scilly*, Lond. 1810. In a gale of 1786 'every ship that lay there was driven to sea, and most of them dismasted' (*Gent. Mag.*).

³ *Correspondence of Admiral Markham*, p. 43; Navy Records Soc. 1904. Again, 'Falmouth harbour preferred (by the captains) because of its repose and difficulty of getting out of it' (Tucker, *Memoirs of the Earl of St. Vincent*, ii, 271, St. Vincent to Sec. of Admiralty).

⁴ W. O. Sec. of State Entry Books, cxiii, fol. 237.

⁵ *Memoir of Wm. Marsden* (Secretary of the Admiralty), p. 111. Privately printed, 1838.

⁶ Admir. Sec. Misc. dviii.

⁷ Treas. Papers, xviii, 67.

⁸ King's MS. 45.

⁹ Gilbert, *Par. Hist. of Cornwall*, iii, 97.

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Scilly being reduced to thirty and Pendennis to twenty pieces.¹ Subsequent papers show that this order cannot have been carried out absolutely, but it may denote the date when the many earthen batteries defending St. Mary's were disarmed. In 1729 Pendennis was in a dilapidated state, there was no accommodation for a garrison, and it was noticed that the powder magazine was on the roof, 'a most dangerous place.'² During the wars of 1739-63 guns were issued to most of the ports for defence against privateer attacks, on condition that they constructed the batteries and provided ammunition themselves. In Cornwall Looe had fourteen, Fowey twenty-one, St. Ives sixteen, Helston (? Helford) ten, and Penzance twenty.³ In 1765 Captain Henry Græme wrote to the Secretary of War that Star Castle 'in its present condition is not only open to every insult from the enemy but equally exposed to the wanton sallies of the drunken and idle.' A considerable quantity of stores was protected by only 'the shadow of a garrison.' The Scillies mounted sixty-five, Pendennis forty-six, and St. Mawes twelve guns, and the last two were in as bad circumstances as the first, nothing having been done to them since 1732.⁴ It has been noticed that the county did but little in the way of building men-of-war for the government, but a return of private shipbuilding yards in 1804 shows that there was a sufficient number of them to satisfy local requirements. The builders named are Thomas Shepherd (and another unnamed) of Fowey;⁵ Thomas Johns of Cadgwith, William Brilham of Coverack, Richard Symons, and J. and R. Symons and Co. of Falmouth, Kempthorne of Helford, Mynerd of Looe, J. Melhuish, Dunn and Henna, and T. Shepherd of Mevagissey, James Matthews of Newlyn, Richard Dingle of Penryn, Rundle and Bone of Polperro, T. Bullock and J. Matthews of Penzance, M. Withell, John Williams, John Brabyn, Thomas Pearce, G. Sloggett, G. Rame, and John Tredwyn of Padstow, Barnet and Alexander Banfield of St. Mary's, Scilly, one unnamed at St. Agnes, one unnamed at St. Ives, John Lane, Richard Hawkins, Richard Roberts, and N. Jennings of St. Mawes, John Matthews and John Stevens of St. Michael's Mount. Many of these builders employed only two or three shipwrights and as many apprentices, with no doubt some subsidiary workmen. The largest firms were the Symons family of Falmouth, employing respectively fifty-six and twenty-nine shipwrights and apprentices.

Beyond the permanent mining industry the prosperity of Cornwall in general, and of Falmouth in particular, during the eighteenth century, was largely based on the packet service and on the practice of smuggling which grew up with it and was carried on to an extraordinary extent. All early smuggling was confined to the illicit export of wool and prohibited wares, and the modern form was consequent on the heavy duties necessitated by the wars that followed the Revolution. By opportunity and position Cornwall was exceptionally well favoured for the enjoyment of the trade. Its boats could meet East Indiamen making the Channel and obtain rich wares in small compass; a run to the Channel Islands, St. Malo, or Roscoff was a pleasant excursion; the influence of the interests connected with the Falmouth packets was stronger in the county than that of the government, so that not only Cornishmen engaged in the traffic, but it attracted boats from the eastern Channel. The trade was not organized in the same way as that worked by the big companies exporting from Dunkirk, Flushing, and Ostend, whose vessels sailed as regularly and systematically as an ordinary cargo line of to-day; but undoubtedly large cargoes were run, and very often, and, from the point of view of economics, it is puzzling that the supply never seemed to overtake the demand. Cornwall was not a wealthy county, and the requirements can only have been local; with the exception of certain articles obtained from Indiamen, of high value in small bulk, the cost of transport for any distance would have been prohibitive; therefore tea and spirits, always the principal commodities, must have been sold and used within a short distance from the coast. The law offered little hindrance; very often, when the revenue officers were not terrorized, they 'wore fog spectacles with bank-paper shades,' of which the dismissal in 1693 of Captain Griffith Bowen, the collector at Padstow, for taking bribes, offers an early example.⁶ The trade developed so quickly that in 1696 it was necessary to establish a revenue station at the Scillies. Two years later revenue vessels were placed round the coast, but there were only two from Plymouth to the Land's End, and one from the Land's End to Bideford.⁷ This measure proved so useless that in 1717 it was proposed to withdraw them and to trust to riding officers ashore,⁸ but the potency of the riding officers may be judged by an instance in 1733 when seven of them met a gang near Falmouth, and were attacked and routed by the smugglers. Both sloops and riding officers were continued, but to little purpose. In 1735 some rum was seized in a barn near Fowey, and on its way to the custom house was carried off by an armed party; 'if the officers attempt to make any seizure they go in

¹ W. O. Ord. *Estab.* i.

² *Ibid.* *Estimates*, xix.

³ Ho. Off. Ord. v, 29. The battery at Penzance cost the corporation £214 1s. and was armed in 1741 (Boase, *Coll. Cornubiensis*, 1542).

⁴ Ho. Off. War Off. v, 5b, 47b.

⁵ In 1761 the harbour rates at Fowey were leased by the Lostwithiel Corporation to Thos. Nicholls, shipwright, for £6 a year (Lostwithiel Corp. MS. 331).

⁶ Treas. Papers, xii, 59.

⁷ Treas. Bd. Papers, lv, 75; lvi, 12.

⁸ Treas. Papers, ccx, 5.

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danger of their lives, and the smugglers have entered into a combination to rescue any person who shall be arrested.' To illustrate this, at the moment when it was written, William Pearce, while being taken to Bodmin gaol, was rescued by a band of forty comrades.¹ Much of the reckless daring shown may have been due to the fact that persons of good social position were protectors and perhaps confederates; 'the countenance given to the smugglers by those whose business it is to restrain these pernicious practices hath brought them so bold and daring that nobody can venture to come near them with safety whilst they are at their work.'²

In 1765 William Rawlings, of St. Columb, a correspondent of Lord Dartmouth, the President of the Board of Trade, gives a detailed and singular account of the way in which the illegal, but hardly secret, commerce was carried on.³ The war of 1756-63 had reduced France to bankruptcy, but he thought that the large remittances from Cornwall had enabled the French to hold out longer than would otherwise have been possible. As history this is an obvious exaggeration, but it is evidence of the large purchases actually made in France, and it may be true so far as the remittances provided money to fit out privateers from the Breton ports. Not long before Rawlings wrote to Lord Dartmouth one of his servants met, at night near Padstow, a cavalcade of sixty horses, each carrying about one and a half hundredweight of tea: 'if in this little spot so much dirty work be done, how much more through the county!'⁴ Unless tradition libels him, John Knill, mayor of Padstow in 1767, was a busy free trader, and no doubt did not confine his transactions to his year of office. Captain Isaac Cocart, too, more than once mayor of Falmouth, originally a smuggler, had been sent by the customs commissioners to catch his former associates, but could not refrain from an occasional speculation in his ancient business; and in 1769 the mayor of Penzance was bound over 'not to be guilty again.' The smuggling from Scilly, says Rawlings, is notorious, and 'another shameful trade is that carried on by the packets, from Lisbon especially, and the West Indies.' Much wine was brought from Lisbon, and sold at little more than half the ordinary price; 'the captains themselves smuggle large quantities and connive at their men doing the same, not allowing them sufficient wages whereon to live without it.' He believed that the duty on smuggled goods in Falmouth alone for one year would amount to more than twice the land tax of the whole county. A month later Rawlings wrote again. He had been in Falmouth while the *Vansittart* East India-man was there, and had been in 'pain to see the vast concourse of people' come for the purpose of smuggling. Every day, including Sundays, people thronged on board as to a fair. Muslins, silks, and other valuable and dutiable articles were sold to the value of at least £5,000, 'nor do I find that there were any seizures made worth notice: I think it is plain that the officers cannot discharge their duty . . . have we not reason to fear they are bribed to overlook these practices?'⁵ Not only the packets, but the salt ships from Lisbon smuggled wine; and as for tea, he estimated that, while ninety families out of a hundred drank it twice a day, not one family in a thousand used that which had paid duty. It came in through the south coast in winter, and north coast in summer. Rawlings reappears in the Dartmouth correspondence in 1775, and expresses the fear that the mania for smuggling was ruining the county for honest work. He mentions that recently the excise vessel off Padstow, instead of chasing, had been chased into the port by a large Irish vessel which 'by way of bravado fired seven guns at the mouth of the harbour, and hung out a flag by way of triumph,' and then sailed to Newquay, where smugglers and excise officers were on excellent terms, to discharge her cargo. It was not uncommon for a hundred horses to be awaiting the arrival of a cargo at Newquay nearly every day of the week.

The audacity with which the free traders carried on their occupation is shown strikingly about this period. In March, 1767, a fleet of nine sail left Penzance for France, quite openly, to fetch their commodities; in 1775 two vessels lay off the same place for three days discharging cargo, the customs collector having to look on helplessly because everyone ashore was either actively interested in the success of the run, or a passive sympathizer. In 1772 a Penzance customs boat was plundered and sunk by a smuggler, and on 29 November, 1777, another sailed into Penzance harbour and carried off the revenue cutter *Brilliant*, which was lying there with a captured cargo in her hold.⁶ References to the Scillies speak of the islands as depending on the trade. Between

¹ Treas. Bd. Papers, cclxxxviii, 53. In 1728 there were 1,283 persons under prosecution in the western ports (Ibid. cclxix, 25).

² Lanisley Letters (*Journ. Roy. Inst. Cornw.*).

³ *Hist. MSS. Com. Rep.* v, App. i, 176, 178, 214.

⁴ John Wesley writes that at St. Ives 'I found an accursed thing among them; well-nigh one and all bought and sold uncustomed goods' (*Journ.*, 25 July, 1753).

⁵ In 1762 there were three East Indiamen in Falmouth, when goods to the amount of £20,000 were sold; 'there are ways and means of dealing with the custom house officers.' People flocked in, horse, foot, and carriage folk, from twenty miles round (S. E. Gay, *Old Falmouth*, p. 93). Also in the same year Falmouth had the distinction of providing the largest seizure yet known, in the shape of 27,529 lb. of tea and 9,000 gallons of brandy—in one haul (*Annual Register*).

⁶ *Cornish Mag.* i, 124; Ho. Off. Papers, 17 July, 1772.

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1780 and 1788 four Falmouth packets were seized for having smuggled goods on board, but the Post Office continued to pay the owners for the hire of the ships while under arrest. Parliamentary enactments were severe enough, but generally the departmental authorities acted almost as if in collusion. Persons prosecuted could always compound with the commissioners of customs at a rate which left them still a profit, and it was to the interest of customs sloops at sea and customs officers ashore to seize half a cargo¹ with no trouble, risk, expense, or delay of prosecution, and to let the delinquents go with the remainder to bring more grist to the mill another day. In the case of the Falmouth packets a seizure was regarded almost as an outrage. Smuggling had been carried on by them during the whole century, and the scale of pay for the men was low, being regulated by the overt indulgence granted to them to carry on what was euphemistically called private trading.² On the rare occasions when seizures were made, the consignees or owners usually had but to petition for the return of the articles to have their prayer granted.

In 1783 a Parliamentary Committee reported that smuggling was carried on 'with the most open and daring violence in every accessible part of the coast,' and that in some places batteries had been thrown up to protect the runs.³ This is no doubt a reference to the battery erected by the famous John Carter, of Prussia Cove, from which he actually fired on H.M.S. *Fairy*, which thereupon sent in her boats to destroy it. At this time there were known to be six large vessels of from 70 to 250 tons working across Channel from South Cornwall, while the revenue cruisers were but small sloops hired by the local customs officials; nor could the cruising men-of-war be expected to give anything more than occasional co-operation. Between 1777 and 1780 there were only two revenue cruisers on the seaboard, one being attached to Falmouth, and the other to St. Ives. Then additional sloops were placed at Falmouth and St. Ives, and new ones at Looe, Penryn, and Scilly. The committee noticed that East Indiamen were met on entering the Channel by a swarm of small vessels which took dutiable goods from them. There is no doubt that some of the more intelligent smugglers acted as government spies in the French ports, and were sure of underhand protection in England, as in the case of 'Cruel Coppinger.'⁴ By 1800 the trade had become so methodical that the smugglers employed their own commercial travellers, and it was estimated that more brandy and rum were smuggled into Cornwall, Dorset, and Devon, than came into the port of London.⁵

The close of the Napoleonic wars saw the beginning of the end of smuggling. The exhaustion of the treasury induced the government to try new methods of repression, and there were now men available in any number to line the coast. In 1818, at the suggestion of Captain William McCulloch, R.N., the 'coast blockade' of Kent and Sussex was instituted, forming a chain of posts within hail of each other, and, in a modified form, the system was extended to the remaining counties. The navy men were not open to the intimidation, and were less amenable to the bribery, that had coerced or persuaded their civilian predecessors; therefore an era of evasion and trickery succeeded the open and defiant violence with which cargoes had previously been run. The Scillies, which had long been a sort of clearing-house for smuggled goods, at once felt the effects, and a subsequent famine was attributed to the loss of 'the chief support' and the excellence of the coast blockade.⁶ It had been intended that the coast blockade service should be carried on entirely by seamen of the navy, but the hardships and the severe restrictions as to social intercourse with their neighbours locally caused them to show so much distaste for it that civilians of all kinds and trades had to be enrolled. The results were not satisfactory; desertion and collusion became prevalent, and in 1829 the formation of a mixed civilian and naval force under the name of coast-guard was commenced. At first this was under the control of the customs department, but in 1831 it was transferred to the Admiralty and became naval in organization. Before 1845 the force was maintained purely for revenue protection, but in that year there was a regulation that every seaman appointed should bind himself to serve in the fleet upon an emergency, and this was the first step in the fashioning of the present coastguard. The change was completed by 19 and 20 Vict. c. 83, which authorized the Admiralty to maintain a force of 10,000 men as a reserve for the navy, composed of men who had served in it, and liable to be called upon to rejoin it. From May, 1857, the districts were placed under the command of captains of the navy, and the coastguard is now far more a military than a revenue force.

A seaboard population engaged in smuggling is not likely to be sensitive about the ethics of wrecking, and the Cornish reputation went from bad to worse during the eighteenth century. In

¹ Which was all on which the officers would get any reward.

² In 1810 the unexpected 'severity' of some customs officers caused a mutiny among the crews of the packets.

³ Parl. Papers (1783) vi, 58.

⁴ S. Baring Gould in *Western Antiquary*, xi, 155.

⁵ Stowe MS. 865, f. 38. See also for smuggling, *Cornish Mag.* i, 112; Hon. H. N. Shore, *Smuggling Days and Smuggling Ways*; Osler, *Life of Lord Exmouth*; Boase, *Coll. Cornub.* and local historians generally.

⁶ The Rev. J. Troutbeck, the chaplain appointed by the duke of Leeds and one of the historians of the islands, was compelled to resign and leave because implicated in a smuggling transaction.

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1722 a Dutch ship, stranded near Penzance, was first stripped and then burnt, so as to destroy all evidence of the crime.¹ Two years later Defoe published his *Tour through Great Britain*, and writes that when at the Scillies the sands were covered with people, after a blowing night, 'going a shoring' in local phrase. This was comparatively harmless, but the Scillonians, he says, 'are charged with strange, bloody, and cruel dealings even sometimes with one another, but especially with poor distressed seamen when . . . they seek help for their lives and when they find the rocks themselves not more merciless than the people who range about them for their prey.' Defoe's truthfulness may be challenged, but thirty years later a Cornishman of position, whose veracity cannot be impugned, wrote still more trenchantly.² The wreckers, he noticed, were mostly tinnerns, who, as soon as a ship was seen to be sailing near the coast, left their work, equipped themselves with axes, and followed the vessel, often to the number of 2,000 men, in the hope that she would come ashore. Sometimes the ship disappointed them, but if she did strike 'they'll cut a large trading vessel to pieces in one tide and cut down everybody that offers to oppose them.' Borlase had seen half-dead men stripped by them, and not long before they had killed a man near Helston who had helped the king's officers. The chain of irrefutable testimony can be carried on to within living memory. A Parliamentary Committee of 1839 reported that 'whilst on other parts of the English coast persons assemble by hundreds for plunder on the occurrence of a wreck, on the Cornish coast they assemble on such occasions in thousands.' They quote an instance of a wreck in Sennen Cove, in 1838, at which 4,000 or 5,000 people assembled, and where the coastguard, unable to save the cargo, were compelled to fire to save their lives.³ Sometimes the crown had to redress an international wrong when justice could not be obtained in the county. In 1764 a French ship went aground at Perranzabuloe, when not only was the whole cargo taken away, but the crew were stripped to their shirts. Unable to obtain a hearing in Cornwall, the captain petitioned the crown through the French ambassador, and was eventually awarded compensation.⁴ France could protect her subjects, but Holland had fallen too low. In 1760 a Dutch vessel stranded in Mount's Bay, but could have been got off had not the people there forcibly prevented it, and after 'barbarously using' the crew, plundered and broke her up.⁵ The officials could expect no assistance even from the middle classes. When a ship was wrecked at Looe in 1751 the customs surveyor endeavoured to form a guard of the townspeople, but instead of helping him they got out their carts and filled them with cargo.⁶ Rarely did a wrecker come before a court of justice, and then every effort was made on his behalf. One man was so far unlucky in 1767, and Mr. Justice Yates, in sentencing him to death, improved the occasion by addressing, not the prisoner, but those present in court 'against so savage a crime.' Great exertions were made to save the condemned man through the member for Launceston, who brought pressure to bear on Lord Shelburne, the Secretary of State, urging that feeling was strong in the wrecker's favour, and that the situation was delicate 'with voters of boroughs just before a general election.' To Lord Shelburne's honour a respite was refused.

As Plymouth grew in importance Cornwall ran still less risk of serious invasion, for a fortified arsenal acts as a conductor in drawing towards itself the enemy's stroke. Moreover an invader requiring a port as a base for the siege of Plymouth would be likely to prefer Dartmouth to Fowey. The American War brought apparent danger, and in 1779 a combined French and Spanish fleet was actually in command of the Channel, with orders to seize Portsmouth, the Isle of Wight, or Plymouth. Sir Charles Hardy, with an inferior British force, was in the western channel, but, in the words of Admiral Colomb, 'was always where he should not have been'; and the way was thus left open for D'Orvilliers, who, on 16 August, was in sight of Plymouth. The panic and preparations there belong to the history of Devon, but Cornwall so far shared in them as to send her miners in hundreds down to the coast. The enemies of England never had a fairer chance, but disease, incompetence, and maladministration rapidly destroyed the fighting value of the allied fleet, and, after standing off and on along the Cornish shore, it returned without bringing Hardy to action or carrying out anything but an aimless cruise. In another way Cornwall became closely interested in the war by reason of the large number of American prisoners confined at Falmouth, Pendennis, Penryn, and Bodmin; a barn at Kergullack, between Penryn and Falmouth, had been hired for the same purpose in 1745,⁷ and this continued in use until 1797, when Falmouth, as being too far

¹ Treas. Papers, ccxxxix, 6.

² Lanisley Letters; Geo. Borlase to Lieut.-General Onslow (*Journ. of Roy. Inst. of Cornw.* vi, 376).

³ *First Rep. of the Constabulary Force Com.* 1839. A local association for the preservation of lives and property from shipwreck had been formed, but had ceased to exist for want of support.

⁴ Ho. Off. Papers, 24 Sept., 21 Nov. 1764; 15 Jan. 1766.

⁵ *Annual Register*.

⁶ *Gent. Mag.*

⁷ In 1747 there were many French prisoners at Helston, who were 'mobbed and insulted,' and whom the magistrates would not protect (Admir. Sec. Min. lviii, 21 Dec. 1747). In 1778 Bowyer's Cellar at Penryn was taken at £120 a year (*Ibid.* lxxxvi).

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from proper supervision, ceased to be used for prisoners.¹ The fact that a victualling contractor at Falmouth had recently been sentenced to £3,000 fine and six months' imprisonment for malpractices no doubt had weight in causing this decision.

When the Revolutionary War broke out the great need was for men. Years of ever-widening commerce and of naval victory had their effect eventually in attracting thousands of men to the sea, but at first the supply of sailors was quite insufficient to man the royal and merchant navies. Therefore, besides the impress system, always working, and a suspension of certain sections of the Navigation Acts, Parliament sanctioned, in 1795 and 1796, an experiment analogous to the ship-money project of Charles I, by requiring the counties each to obtain a certain number of men for the navy who were to be attracted by a bounty to be raised by an assessment charged in every parish like other local rates.² In 1795 the county was called upon for 194, and in 1796 for 252 men, comparing with 393 and 509 for Devon, and 351 and 455 for Somerset. The ports, also, were required to procure a supply of men, an embargo being placed upon all British shipping until they were obtained. Falmouth was assessed at twenty-one men, Fowey seventy, Gweek seven, Looe sixteen, Padstow nineteen, Penryn eleven, Penzance thirty-five, Scilly three, St. Ives thirty-one, and Truro eleven. In 1798 the need of men was greater than ever; Ireland was in revolt, the discontent which had flamed into the mutinies of 1797 was still smouldering in the fleets, the French armies were terrorizing Europe, and the battle of the Nile was not won until August. In May all protections from the press, for fishermen and others, were suspended, and by an Order in Council of the 14th of that month a new force, the Sea Fencibles, was directed to be enrolled. It was raised with the intention of meeting an invading flotilla with another of the same character, and for the purpose of manning the coast batteries; it was to be composed of fishermen and boatmen, as well as the semi-seafaring dwellers of the shore who were not liable to impressment. The order applied to the whole of Great Britain and Ireland, but had especial reference to that bastion, extending from Norfolk to Hampshire, which fronts the continental centre, and is always particularly exposed to attack. The men were to be volunteers, and the principal inducement offered was that while enrolled the seafaring members were free from the liability to be impressed; they were under the command of naval officers, and were paid a shilling a day when on service. South Cornwall was divided into two districts—one from the Rame Head to the Dodman, with one captain, six lieutenants, and 422 men; the other from the Dodman to the Land's End, with one captain, seven lieutenants, and 723 men. On the north coast there were six officers and 463 men from the Land's End to Hartland Point; the Scillies were a separate district with three officers and 340 men.³ These numbers show that enrolment could not have been restricted to seafaring men, and that practically every one who volunteered was entered.

The expectation of invasion did not become acute until 1801, when Napoleon collected his army and flotilla at Boulogne and in the neighbourhood. On 24 July Nelson, just returned from the Baltic, was placed in command of the eastern Channel, where the danger was greatest. English naval and military officers were not alarmed for the western counties, and Napoleon's own dispositions and the character of his preparations showed that they were not his objective. When the war was renewed in 1803, the Sea Fencibles were reconstituted in deference to popular fears, but among professional men the force was regarded with contempt as a refuge for skulkers in the lower grades, and for officers, who were better paid for doing nothing on shore than their comrades were at sea. The outer ring of fleets, with a great volunteer army on shore, were relied upon for security until Trafalgar extinguished the possibility of invasion. Cornwall, however, entered with enthusiasm into a decorative defence by raising volunteer artillery corps round the coast at St. Ives, Mount's Bay, Pendennis, Scilly, Fowey, Maker, Portreath, and East and West Looe, most of them with several uniforms. The Ordnance Department encouraged their spirit by providing guns for batteries of position, sending four to Portreath, where the ground was furnished by Lord De Dunstanville; twelve to St. Ives, for a battery erected by the townspeople; fourteen to Mount's Bay, and four to St. Anthony, Falmouth (both dismantled in 1817); six to Mevagissey; ten to Fowey, where three batteries had been thrown up on ground belonging to the town; ten to Crinnis Cliff, and four to Looe.⁴ Besides the permanent fortifications at the Scillies there were also twelve open-earth batteries.⁵ It was perhaps fortunate that the men behind the guns in these local batteries were never required to meet Napoleon's regiments of the line. The inspecting officer of the Mount's Bay artillery volunteers reported in 1805 that it was 'a very indifferent corps . . . the officers appear to have no sort of command among the men. . . . I have sometimes suspected that many of them were only hired and dressed up for the day,'⁶ and it is not likely that the Mount's Bay corps was much worse than

¹ *Parl. Papers* (1798), I, 143. It is worth noticing that the Americans were confined not as prisoners of war, but as 'under suspicion of high treason.' Had the fortune of war been adverse to the rebel colonies it would probably have gone hard with at least a percentage of these men.

² Stat. 35 Geo. III, c. 5; Stat. 37 Geo. III, c. 4.

³ *Parl. Papers* (1857-8), xxxix, 337.

⁴ W. O. Ord. *Engineers*, cxlvii.

⁵ *Ibid.*

⁶ *Trans. of Penzance Nat. Hist. and Antiq. Soc.* i, 75, N.S.

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others. The forts and batteries built in Cornwall in 1862, and subsequently, as part of the western defences of Plymouth, belong to the history of the fortifications of that town. New fortifications at the Scillies are now (1905) approaching completion.

In 1795, and succeeding years, a chain of signal stations was established round the British coast for the purpose of conveying intelligence, but Maker church tower had been in use as a look-out post long previously. On the signal post there a red flag at the pole and two blue ones at the outriggers signified that the enemy was in sight. Besides Maker, other locations were Nealand, near West Looe, the Dodman, Gribben Head, Black Head, Manacles Point, Landewednock, Penhale, Trevescan, St. Levan, Purdenneck, Mount's Bay, St. Anthony (Falmouth), Tregony Hill, and St. Martin's Head (Scilly).¹ None of these was a semaphore telegraph, as were some of the more eastern stations.

The most noticeable wrecks that have occurred in Cornish waters are :—H.M.S. *Hind*, 8, on 11 December, 1668, in Broad Sound ; H.M.S. *Pembroke*, 32, 23 February, 1693–4, on the Lizard ; H.M.S. *Colchester*, 44, 16 January, 1703–4, in Whitsand Bay, Land's End ; H.M.S.S. *Association*, 90, *Eagle*, 70, *Romney*, 50, *Firebrand* and *Phoenix*, fireships, 22 October, 1707, on the Giltstone and other Scilly reefs ;² H.M.S. *Worcester*, prize, 14, on 6 October, 1708, off the Land's End ; H.M.S. *Royal Ann*, galley, 40, on the Lizard, 10 November, 1721 ; H.M.S. *Lizard*, 14, on 27 February, 1747–8, in Broad Sound ; H.M.S. *Savage*, 14, in 1748, on the Lizard ;³ the Falmouth packet *Hanover* (from Lisbon), in December, 1760, at Padstow ;⁴ the French man-of-war *L'Apollon*, in May, 1773, off the Land's End ;⁵ H.M.S. *Nimble*, cutter, in Mount's Bay, 1780 ; the *Nancy*, East India packet, in March, 1784, on the Scillies ;⁶ H.M.S. *Colossus*, 74, on the Scillies, 9 December, 1798 ; H.M.S. *Fearless*, 14, in Cawsand Bay, 19 January, 1804 ; H.M.S. *Anson*, 44, in Mount's Bay, 27 December, 1807 ;⁷ H.M.S. *Primrose*, 18, and the *Despatch*, transport, on the Manacles, 22 January, 1809 ;⁸ H.M.S. *Wildboar*, 10, on the Runnelstone, 15 February, 1810 ; H.M.S. *Bloodhound*, 12, on Trevoze Head, in 1811 ; the *Queen*, transport, on Trefusis Point, 14 January, 1814 ;⁹ H.M.S. *Whiting*, 4, off Padstow, on 21 September, 1816 ; H.M.S. *Forester*, 10, St. Martin's Island, 13 February, 1833 ;¹⁰ the *Ranger*, packet, on Trefusis Point, 15 February, 1838 ;¹¹ the *Thames*, on the Scillies, 4 January, 1841 ;¹² the *Brigand*, on the Scillies, 12 October, 1842 ; the *Jessie Logan*, East Indiaman, at Boscastle, November, 1843 ; the *Nile*, on the Stones, off Godrevy, November, 1854 ;¹³ the *John*, emigrant ship, on the Manacles, 1 May, 1855 ;¹⁴ the *Ocean Home*, run down off the Lizard in 1856 ;¹⁵ the *Bencoolen*, at Bude Haven, 19 October, 1862 ;¹⁶ the lifeboat at Polpear (Lizard) wrecked and three men drowned, 8 January, 1866 ; the *Devon*, government lighter, on the Brisons, 23 October, 1868 ;¹⁷ the *Delaware*, on the Scillies, 20 December, 1871 ;¹⁸ the *Schiller*, on the Retarriers, 7 May, 1875 ;¹⁹ the *Mosel*, at Church Cove, 9 August, 1882 ; the *Alliance*, at Boscastle, 7 December, 1884 ;²⁰ the *Suffolk*, on the Lizard, 28 September, 1886 ; the *Brankelow*, at Gunwalloe, 21 April, 1890 ;²¹ the *Camiola*, on the Sevenstones, 1 October, 1892 ; H.M.S.S. *Lynx* and *Thrasher*, near the Dodman, 29 September, 1897 ; the *Mohegan*, on the Manacles, 14 October, 1898 ;²² the *Paris*, on the Manacles, 21 May, 1899 ;²³ the Padstow steam lifeboat, *James Stevens*, No. 4, capsized 11 April, 1900 ;²⁴ the *Khyber*, at Porthgwarra Cove, on 14 February, 1905.²⁵

In 1816, eight years after its introduction on the east coast, Manley's mortar apparatus was sent for use at the Lizard Point and at the Manacles. The first lifeboat established (by Lloyd's) was at Mount's Bay, in 1803 or shortly afterwards.

¹ Admir. Sec. Misc. dxcii.

² No one was saved from the *Association* or *Eagle*, one man from the *Romney*, and twenty-five from the *Firebrand*. The *Phoenix* was afterwards got afloat again.

³ None saved.

⁴ She had got into the Bristol Channel by mistake ; sixty lives lost.

⁵ None saved.

⁶ Her fate was only known by some letter bags being washed up.

⁷ Sixty lives lost.

⁸ One man saved from the *Primrose* ; 120 drowned. Altogether 214 bodies were recovered.

⁹ Upwards of 300 lives lost. ¹⁰ Afterwards got off. ¹¹ She was carried 150 ft. above high-water mark.

¹² Mistook the St. Agnes Light for the Longships ; sixty-one drowned.

¹³ No survivors. Five vessels wrecked on the Scillies this year.

¹⁴ 200 lives lost.

¹⁵ Seventy-five drowned.

¹⁶ Twenty-seven drowned. In January of this year four ships were lost on the Land's End, and another in Mount's Bay, with all on board them.

¹⁷ Sixteen drowned. ¹⁸ Forty-five drowned.

¹⁹ 312 drowned.

²⁰ Twenty drowned.

²¹ Compasses had been tampered with by the crew.

²² One hundred and six drowned.

²³ Afterwards got off.

²⁴ Eight drowned.

²⁵ Twenty-three drowned.

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APPENDIX I.

BEACONS.

| Name. | Established. | Height in feet above high-water mark. | Name. | Established. | Height in feet above high-water mark. |
|----------------------------------|----------------------------|---------------------------------------|-----------------------------------|--------------|---------------------------------------|
| Balk (Lizard) | 1859 | 217 | Middle Hummock (Lizard) | 1859 | — |
| Beast Point (Lizard) | 1859 | — | Raymond (Mount's Bay) | 1850 | 16 |
| Black Rock (Falmouth) | Very early (see p. 500) | 36 | Runnelstone (high) | 1821 | 22 |
| Cresser (Mount's Bay). | 1850 | 16 | Runnelstone (low) | 1820 | 22 |
| Crow (Scilly) | 1848 | 21 | St. Martin's, Scilly | 1683 | 185 |
| Gear Rock (Mount's Bay). | — | 31 | Wolf Rock | 1793 | 12 |
| Gribben Head | Before 1764. | 250 | Woolpack (Scilly) | 1848 | 21 |

BUOYS.

| Name. | First laid. | Name. | First laid. |
|--------------------------------|-------------|-----------------------------|-------------|
| Manacles (bell) | 1838 | <i>Mount's Bay.</i> | |
| Runnelstone (bell) | 1825 | Mt. Mopus | 1851 |
| | | Lowlee | 1851 |
| <i>Whitsand Bay.</i> | | <i>Godrevy.</i> | |
| Knight Errant (bell) | 1892 | Stones | 1858 |
| <i>Falmouth.</i> | | <i>Scilly.</i> | |
| St. Anthony | 1894 | Hats | 1878 |
| Castle | 1894 | Spanish Ledge | 1873 |
| Lugo | 1847 | South Bartholomew | 1894 |
| East Narrows | — | North Bartholomew | 1873 |
| Vilt | — | Old Wreck | 1873 |
| St. Just | 1896 | Gunner | 1878 |
| West Narrows | 1894 | | |
| Governor | 1868 | | |

APPENDIX II.

CHRONOLOGICAL LIST OF MEN-OF-WAR BUILT IN CORNWALL, WITH DETAILS OF WAR SERVICES.

Abbreviations used:—C. and C. = Convoy and cruising duties; Ch. = Channel; W.I. = West Indies; A.O. = Admiralty Order; N.A. = North America.

ALDERNEY (sloop), 235 tons, 10 guns; built at Saltash 1757. Services: C. and C. 1757–8; Blockade of Dunkirk 1759; C. and C. 1760; Capture of Belleisle 1761; Madagascar 1762; C. and C. 1763; C. and C. 1768–82. Sold 1783.

TAMAR (sloop), 313 tons, 16 guns; built at Saltash 1758. Services: C. and C. 1759; Quiberon Bay 1760; Ch. 1761; Newfoundland 1762–3; Byron's voyage of circumnavigation (Capt. Pat. Mouat) 1764–6; Falkland Islands (Capt. Anth. Hunt) 1767–70; N.A. 1771–6 (Capt. Ed. Thornborough; Lt. Jos. Peyton). Made fireship and name changed to *Pluto* by A.O. 23 Sept. 1777; Ch. 1778–80; Keppel's action of 27 July, 1778, off Ushant. Condemned 1781.

DISPATCH (sloop), 382 tons, 18 guns; built at Falmouth 1804. Services: Ch. 1804–6; C. and C. 1807; W.I. 1808–11. Broken up 1811.

AVON (sloop), 391 tons, 16 guns; built at Falmouth 1805. Services: C. and C. 1805–6; W.I. 1807–11; undergoing repair 1812; Ireland 1813–4. Sunk (Capt. Hon. J. Arbuthnot) by United States man-of-war *Wasp* 1 Sept. 1814.

CYNTHIA (sloop), 232 tons, 10 guns; built at Falmouth 1821. Services: Wrecked W.I. 6 June, 1827, while running as packet brig.

ALADDIN (packet), 233 tons; built at Falmouth 1824. Services: Post Office steam packet, 100 h.p. Name subsequently changed to *Jasper*.

INDUSTRIES

INTRODUCTION

CLIMATE, mineral wealth, and geographical position are the three elements which have determined in the past and which still determine the occupations of the inhabitants of Cornwall. A coast-line of enormous extent with estuaries which afford safe shelter for ships and fishing craft; mineral resources such as no other county in England possesses; a climate which enables sub-tropical plants and shrubs to grow in native luxuriance—to these natural advantages Cornwall's chief industries—fishing, mining, and horticulture—are to be attributed. Foundries and boat building, the manufacture of explosives, safety fuses and the like, are merely subsidiary and supplementary. In the present work the larger industries are dealt with separately by writers of practical knowledge and experience. In what follows here it will suffice to call attention to those industries which have either become extinct or have not acquired a leading position in the county.

The numerous references in the Patent and Close Rolls to the king's mines of gold and silver in the counties of Devon and Cornwall render it certain that, in the fourteenth and fifteenth centuries, gold and silver were found in these counties in sufficient quantities to be worth working. In 1378¹ the prior of Bodmin and the abbot of Buckfast had letters patent enabling them 'to control the profits arising from the gold and silver mines' leased to Henry of Burton, and requiring them to account for one-seventh of the profits to the king. Thirteen years later² a commission was appointed to survey the 'newly-found mines of gold, silver, lead, and tin, and other metals, and to set the necessary workmen and labourers to work them for the king's advantage.' In 1461³ Sir John Nevill received a grant of 'the king's mines in Devon and Cornwall in which gold and silver can be found,' at a rent of £100 yearly. In 1480⁴ surveyors were appointed to superintend the agreement which had been made nine years previously with Sir John Fogge for the working of all mines bearing gold and silver in Devon and Cornwall. These references are illustrative of many others, all of which go to prove that mining for gold and silver was carried on with satisfactory results.

It is curious however that the rolls supply no data enabling us to discover either the precise locality of the mines or the amount of gold and silver obtained from them.

Within comparatively recent years small quantities of gold have been found in the parishes of St. Stephen in Brannel, St. Austell, Redruth, Gwennap, Manaccan, Illogan, Budock and elsewhere, but nowhere in payable quantities.⁵

Lead ore rich in silver—at Wheal Pool near Helston, yielding forty ounces of silver to the ton, and at Wheal Rose, yielding sixty ounces to the ton—was discovered towards the end of the eighteenth century, but the cost of working was so great as to lead to the abandonment of the enterprise. At Guarnek near Truro good results were obtained in or about the year 1720; and when operations were resumed at the same mine in 1814, out of 800 tons of silver-lead ore thirteen-twentieths were silver. In 1788 lead rich in silver, and also fibrous native silver in the gossan, were discovered in the parish of Peranzabuloe at Wheal Mexico; but it was soon found that below a certain level the silver disappeared. Nevertheless, at Trebicken, in the same parish, so late as 1860 the following results were obtained :—⁶

| | tons | cwts. | qrs. | lb. | | £ | s. | d. |
|--------------|------|-------|------|-----|-------|------|----|----|
| 1859 Sep. 14 | 1 | 14 | 2 | 0 | worth | 164 | 15 | 6 |
| " 26 | | 2 | 0 | 0 | " | 7 | 3 | 4 |
| 1860 May 13 | | 1 | 3 | 16 | " | 41 | 4 | 4 |
| " | | 14 | 3 | 19 | " | 100 | 14 | 1 |
| " | | 4 | 3 | 11 | " | 1 | 16 | 4 |
| Aug. 14 | 1 | 9 | 0 | 12 | " | 485 | 3 | 0 |
| " | 2 | 19 | 0 | 1 | " | 286 | 3 | 10 |
| | 7 | 6 | 1 | 3 | | 1087 | 0 | 5 |

At Herland in Gwinear, early in the last century, silver worth £8,000 was obtained in the form of vitreous silver ore, arsenicated silver ore, and black oxide of silver. A little later, a discovery of native silver and silver ore was made at Wheal Duchy near Callington. The value of the silver obtained there was about £3,000. Besides the places already mentioned, the most noteworthy sources of silver in the past have been Dolcoath, Wheal Basset, Ludcott near Liskeard, and Wheal Brothers near Calstock.

¹ Pat. 2 Ric. II, 3 July.

² Pat. 15 Ric. II, 11 August.

³ Pat. 1 Edw. IV, 2 May (p. 191).

⁴ Pat. 20 Edw. IV, 12 June (p. 213).

⁵ *Trans. Roy. Geol. Soc. of Cornwall*, xii, 241.

⁶ Given by R. Hunt, F.R.S., in his *British Mining*, from the account books of the mine.

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Moreover there is good authority for the statement that silver has been found in small quantities in nearly every mining district in the county. Quite recently, at Perranuthnoe, not far from Great Wheal Neptune (a lode running east and west whence silver to the value of £500 is said to have been obtained some fifty years ago), a new lode called the Sedgman, bearing about 10° W. of N., has been discovered. The silver mineral, which occurs here in the gossan, consists almost entirely of cerargyrite (silver chloride, otherwise known as horn silver), but a few specimens of argentite (sulphide of silver) have also been found. An inspection of the assay-returns of this lode shows that the yield of silver has been extremely uncertain and fluctuating in amount, the ore, along the course of the lode, having afforded in some parts as much as 11,000 ounces per ton, while in others it has produced less than an ounce per ton. The Sedgman lode has been found to extend for at least 800 yards; and, at the present time, there is every indication that the mine will prove sufficiently rich in silver not only to pay expenses but also to yield a fair return on past outlay.¹

The manufacture of textile fabrics has never been considerable at any time in Cornwall. In the reign of Edward III Cornish wool was regarded as so 'gross and weak' that the collectors were constrained to obtain an ordinance from the king and council whereby a composition of one hundred shillings in money was effected for every sack of wool required by the king.² An Act of Queen Elizabeth³ allowed the manufacture of 'woolen clothes called plaine white straighes and pinned white straighes.' These are described as a 'base and course kind of clothes usually made for the use of poore people beyonde the seas and most commonly shipped into Brittain (Brittany) to serve the use of the poorer sort there.' More recently the woollen manufacture was carried on at Launceston, Menheniot, Callington, Ponsanooth and Truro, but it is now decayed.

To meet the growing demands of the mining industry, which had hitherto been dependent upon London for its supply of blasting material, in or about the year 1813 the manufacture of gunpowder was commenced at Kennall Vale by Messrs. Benjamin Sampson, John Ferris Devonshire, and Edward Allen, who entered into a deed of partnership, dated 30 December, 1812, for a term of twenty-one years, with the object of carrying on a gunpowder business, in the name of The Kennall Gunpowder Mills Company, on land at Kennall which had recently been acquired by them for that purpose. Messrs. Devonshire and Allen retired prior to the determination of

the lease, leaving Mr. Sampson sole proprietor, who in 1827 also acquired the gunpowder works and business which had been carried on since 1822 by Mr. John Nicholls at Cosawes about a mile from Kennall. Mr. Richard Lanyon became manager of the works in 1828 with a tenth share in the business. In 1840 Mr. Sampson died and was succeeded by his nephew, Mr. Benjamin Sampson. On the death of Mr. Richard Lanyon in 1863 his eldest son Mr. William Henry Lanyon became manager. In the following year Mr. Benjamin Sampson (the nephew) died, and Mr. William Shilson succeeded to his interest in the business. Upon the retirement of Mr. William Henry Lanyon in 1868, Mr. Shilson became sole owner of the works, which he carried on under the name of The Kennall Gunpowder Company until his death in 1875. After his death his sons, Messrs. Charles Shilson and Daniel Henry Shilson, as his executors, carried on the business until the year 1898, when a limited company, under the name of Curtis's & Harvey, Limited, was formed for the purpose of effecting the amalgamation of the various gunpowder businesses in the United Kingdom, and the Kennall works were then turned over to the new company, by whom they are still owned; but little, if any, business is now being done there. Other powder factories were built in various parts of the county—at St. Allen by Mr. Humphrey Willyams; at Nancekuke, which was for some years held on lease by Mr. Thomas Davey, and at Herodsfoot. The two former have long since been abandoned, while the latter, after having been for many years carried on by Mr. J. C. Isaac and other members of his family under the name of The East Cornwall Powder Company, was taken over by Curtis's & Harvey on the occasion of the formation of that company.

The kind of powder used in the mines prior to the invention of the higher explosives was the common large-grained powder. At Kennall there was also manufactured compressed powder, cylindrical in shape, with a small hole in the centre through which the safety-fuse could be passed; but this was not used to any great extent in Cornwall.

In the autumn of the year 1879—at the request of many practical mine agents, engineers, and others interested in mining—a committee on mining explosives was appointed jointly by the Royal Cornwall Polytechnic Society, the Miners' Association of Cornwall and Devon, and the Mining Institute of Cornwall, to inquire into the nature, economy, efficiency and safety of the various explosives in use or proposed for use in the mines of Cornwall and Devon. This committee conducted two series of experiments at Seveock Quarry, near Chacewater, and also obtained answers to numerous questions bearing upon the subject from the leading mine managers in Cornwall. The committee reported in the

¹ From information supplied by the proprietor, Mr. G. D. McGrigor, including a report by Mr. F. H. Butler, M.A., A.R.S.M.

² *Cal. of Close 17 Edw. III*, p. 13.

³ 27 Eliz. cap. 18.

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following year.¹ In their report they stated *inter alia* that 'for all ground which is not of great hardness or very wet the explosives of moderate power, such as compressed powder and common powder, are most advantageous,' and 'for ground of extreme hardness or which is very wet, the stronger explosives should be used, such as dynamite, Liverpool cotton-powder and tonite.' Their experiments proved that a piece of ground could be driven more cheaply by powder than by dynamite, but that in the use of the dynamite, by reason of its being a more powerful explosive, less of it was required for each hole that was charged, and that it was not necessary to bore such deep holes for it as for powder. Consequently the miner preferred the dynamite, for although it might be a little more costly per fathom of ground, it entailed less labour, and the ground could be driven more quickly. From that time the use of powder in Cornish mines decreased whilst that of dynamite increased. Powder continued for some little time to be used in the mines to a limited extent for driving in soft ground, but the price of dynamite, which at the time of the trials above referred to had been £200 per ton, fell during the next ten years to £65, and the use of powder in the mines then ceased almost entirely. In granite and other quarries in the county powder continues to be used because the nitro-compounds are too violent for quarrying purposes and shatter the stone too much; but the depression in the granite trade, owing to the import of granite from Norway and other causes, renders the demand for powder considerable.

At the present time very little dynamite is used or made, that particular form of explosive having been superseded by improved forms of nitro-compound explosives known as gelignite, gelatine-dynamite, and blasting gelatine.

For the manufacture of these high explosives, as they are called, two factories of considerable importance have been built in Cornwall.

The factory of the National Explosives Company at Upton Towans, near Hayle, was opened in 1889. Various considerations led to the selection of this particular site, the chief of these being the cheapness and extent of the land there and then available, its isolation as a property, and at the same time its comparative nearness to the numerous mines in the county. It embraces within its boundaries over a square mile of downs, and includes several properties besides Upton Towans. From the date of its inception the factory has been uniformly successful. It is now four times larger than it was in 1889 and affords employment, in round numbers, to five hundred men and two hundred women. To guard against accidents numerous precautions are adopted. Discipline, according to carefully defined rules, is rigidly enforced; the employés are

searched before commencing work for such articles as may, under any circumstances whatever, cause ignition or explosion; while the buildings used for the making and storing of explosives are kept scrupulously clean. As the result of these precautions human life is shown, by statistics, to be quite as secure within the factory as outside. The most serious accident which has occurred was on 5 January, 1904, when four men lost their lives. This accident is supposed to have been caused by the sudden fall of a lead-lined wooden tank cover which slipped from a workman's hands when engaged in running off nitro-glycerine from the tank. The products manufactured here are of various kinds. Besides explosives for mining purposes, including dynamite (No. 1), haylite, gelignite, gelatine-dynamite and blasting gelatine, and an enormous quantity of raw materials in the shape of sulphuric acid, nitric acid and nitro-glycerine, the National Explosives Company contracts largely with His Majesty's Admiralty and War Office, and with many foreign governments, for the supply of materials required for the purposes of ammunition. These consist of the following explosives: gun-cotton, collodion cotton, compressed gun-cotton, cordite, and cordite M.D. The cordite manufactured here is of very superior quality and has recently received commendation from a commission appointed to investigate War Office contracts.²

Soon after the formation of the National Explosives Company, in the same year a second company was founded with a similar object by Mr. Thomas Pryor of Redruth and Mr. P. R. Mackay of London. This was the British and Colonial Explosives Company, who acquired a tract of land and established a factory for the manufacture of dynamite at Perranporth. For four years this company maintained a fierce but unequal struggle with Nobel's Explosives Company of Glasgow, who, for the purpose of defeating the new competition, lowered their prices to such an extent as to render the manufacture of explosives at Perranporth unremunerative. Negotiations were opened between the two companies, and resulted in the transfer of the Cornish factory to Messrs. Nobel in November, 1893. At that time there were altogether about 100 persons employed. Since the amalgamation, allowing for periods of depression, a profitable and progressive business has been carried on. The Perranporth Factory, which covers about 150 acres, and now employs in round numbers 200 persons of both sexes, embraces five departments:—(1) Blasting Explosives Department for

² Of the National Explosives Company the Commissioners say, 'This firm has manufactured sizes (of cordite) 50, 44, 30, 20 and 5, and has been very successful all round, especially in the larger sizes, compared with other contractors.'—Blue Book entitled, *War Office Contracts*, 1 August, 1900, p. xxviii.

¹ *Report of the R.C.P. Soc.* 1880. Supplement.

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the manufacture of dynamite (No. 1), blasting gelatine, gelatine-dynamite, and gelignite; (2) Acid Works; (3) Nitrate of Lead Department; (4) Artificial Manure Works; (5) Engineering Department. By means of the recently opened railway line between Newquay and Chacewater the factory has been brought into direct communication with the Great Western Railway system. It will be observed that this factory, unlike that at Hayle, does not engage in the manufacture of explosives required for the purposes of ammunition.

The manufacture of safety fuse at Tuckingmill demands something more than a passing notice, not only because it is the largest industry of its kind, but also because the inventor of the safety fuse was a Cornishman born in that neighbourhood. The frequent accidents resulting from the use of explosives in tin and copper mining, and chiefly owing to the uncertain duration of the time between the lighting of the rush or quill and the exploding of the charge, led Mr. William Bickford in or about 1830 to turn his thoughts towards the invention of some method whereby blasting operations could be conducted with the minimum of risk to the miner. Mr. Bickford's motives were purely philanthropic; it remained for his successors to turn his invention into an extensive and legitimate commercial enterprise. On 6 September, 1831, Mr. Bickford took out his first patent for the 'Miners' Safety Fuse.' His object was to provide a protected core of powder, thin and continuous, along which the fire might travel slowly at a uniform and determinate rate of speed. This result he obtained by causing a number of jute threads, passed through an orifice and stretched by means of a weight attached to their extremities, to rotate slowly while, at the same time, a small current of fine powder fell into the tube thus formed, and was retained therein as a slender core. To use his own words in the specification of his process:—

I embrace in the centre of my fuse, in a continuous line throughout its whole length, a small portion, or compressed cylinder, or rod of gunpowder, or other proper combustible matter prepared in the usual pyrotechnical manner of firework for the discharging of ordnance; and which fuse so prepared I afterwards more effectually secure and defend by a covering of strong twine made of similar material, and wound thereon, at nearly right angles to the former twist, by the operation which I call countering, hereinafter described; and I then immerse them in a bath of heated varnish, and add to them afterwards a coat of whiting, bran, or other suitable powdery substance, to prevent them from sticking together or to the fingers of those who handle them; and I thereby also defend them from wet or moisture or other deterioration, and I cut off the same fuse in such lengths as occasion may require for use; each of these lengths constituting when so cut off a fuse for blasting of rocks and mining,

and I use them either under water or on land, in quarries of stone and mines for detaching portions of rocks, or stone or mine, as occasions require, in the manner long practised by, and well known to miners and blasters of rocks.

Previous to the invention of safety fuse the devices for conveying the fire to the charge were of the most crude and primitive description. Sometimes a small trail of fine gunpowder from the charge to an extemporized slow-match, such as impregnated paper; sometimes quills plucked from geese, filled with fine grain powder and lengthened where needful by the insertion of one quill into another; while, oftener still, rushes were used, the rush having been first split, the pith scooped out, its place filled with powder, and the two halves bound together again by fine string. Mr. Bickford's invention has been well described as 'the very best means of blasting ever devised, combining certainty, economy, and safety.'¹

Numerous and important improvements have since been effected by the inventor's successors, resulting in the adoption of Bickford's safety fuse throughout the world. It has for many years been used by the English War Office, Admiralty, and other Government departments both at home and in the colonies; whilst its adoption by foreign governments and by foreign engineers and miners has led the proprietors to establish many factories on the continents of Europe, America, and Australia. Of the improvements introduced within the last twenty years, the most important has been an ingenious device whereby the danger resulting from the use of a naked light or spark, for the purpose of igniting the fuse, has been completely obviated. By means of this 'Colliery Fuse and Safety Lighter,' blasting operations can be performed with safety in collieries and mines where inflammable gases are present, both the ignition and combustion of the fuse being effected without the emission of any spark or flame to the surrounding atmosphere. Another invention worthy of note is the volley-firer and instantaneous fuse, by means of which several charges can be fired simultaneously, and a greater effect obtained than if the same charges were fired independently.

To the late Major John Soloman Bickford, and to the late Dr. George Smith, antiquary and historian, who married the inventor's daughter, belongs the credit of laying the foundations of safety fuse as a commercial undertaking. They directed its manufacture throughout their lives, and were succeeded by the inventor's three grandsons, the late Mr. Bickford Smith, M.P., Sir George J. Smith of Treliske, and Mr. H. Arthur Smith, M.A., Barrister-at-law. With the two latter are now associated four great-grandsons of Mr. Bickford. To Mr. Thomas

¹ Dr. Ure's *Dictionary of Arts, Manufactures and Mines*, p. 527.

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Davey belongs the larger share of the credit for the original mechanical appliances, and to other members of the Davey family, still identified with the industry, the credit for bringing chemical science to bear upon the processes. At the Tuckingmill factory, where between 200 and 300 persons are employed, there has also been a remarkable hereditary succession of the original employés (chiefly feminine), which to-day includes grandchildren and great-grandchildren of those who made the first safety fuse under the guidance of Mr. William Bickford.

It might have been supposed that ship-building and boat-building would have been assigned a prominent position in the annals of Cornwall. Such is not the case. The industry is hardly once referred to in the histories of the county.¹ Neither has it been possible to supply the defect from other sources. The large number of ships which sailed from Cornish ports in the fourteenth century to take part in the French wars, the close association of Falmouth with the Mail Packet service for more than 160 years, and above all the Cornish fisheries, would lead us to conclude that boat building and repairing have been established for centuries in the leading ports. All that we certainly know, however, is that it was to Little Falmouth that the packets went for repairs and refit; that at Mevagissey ship-building existed 150 years ago; that at St. Ives boat-building has been carried on by members of the same family for a century; that it was introduced into Scilly in 1820. The history of the industry at the latter place is probably typical. It was at its zenith from 1840 to 1860, and during that period wooden ships up to 600 tons register were built. It became extinct about 1885. At Falmouth twenty years ago there were upwards of a dozen yards, now there are only three or four. At Par, between the years 1867 and 1879, ten ships were turned out whose tonnage ranged from 160 to 450 tons; now repairing only is done. At Penzance ocean-going vessels were built forty years ago, and schooners at Newlyn; now ship-building is abandoned, and only small boats are constructed. The same holds good of Looe and of Cornish ports generally. The cause of the decline has been the substitution everywhere of steam for

sails, iron or steel for wood, and also the unrestricted port to port trade which is permitted to foreign vessels. Within the last twenty-five years, however, a few sea-going schooners have been built at Falmouth, Truro, Penryn, and Fowey, while yachts up to 20 tons, and boats known locally as quay-punts are still built at Falmouth; fishing boats, pleasure boats, and boats for the customs and coastguard at St. Ives; lifeboats at Mevagissey; and boats suitable for local needs in some other places. More important still, there are between seventy and eighty vessels registered at Lloyd's of Cornish construction. Of these, twenty-six are built of wood, and the rest of iron and steel. The former were built at Newquay, Polruan, Padstow, Falmouth, and Calstock; the latter at Falmouth and Hayle. Three are steel steamers ranging from 1,978 to 3,860 tons, and were constructed by Messrs. Harvey and Company, a firm which no longer builds vessels. Steamers, steam tugs, the latter well known for their efficiency, and composite vessels of different sorts, continue to be built at the Falmouth Docks Ironworks, which in its various departments employs between 500 and 600 men.

Of other Cornish industries, besides those dealt with in separate articles, the most noteworthy is the flour mill at Loigans, with its biscuit factory at Hayle, affording employment for 184 men and 32 women. There are breweries at Falmouth, St. Austell, Redruth, and Hayle; flour mills throughout the county; biscuit and jam factories at Truro; boot and bacon factories at Redruth; rope-walks at Penryn, Penzance, and elsewhere; all of which, together with some minor industries, have been created by and administer to local needs.

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GRANITE QUARRYING

The enormous increase in the commercial enterprise and trade of the country in the first half of the last century made the construction of extensive dock and harbour works necessary

¹ Carew's statement is rather ambiguous. 'Cornwall,' he writes, 'is stored with many sorts of shipping (for that term is the genus to them all), namely, they have cock-boats for passengers, sein boats for taking of pilchard . . . barks and ships for traffic.' *Survey*, p. 91, ed. 1811.

in order to accommodate our rapidly increasing naval and mercantile marine. A comparatively strong, durable, and cheap material for those portions of such engineering works as had to resist heavy pressure or wear was found in the granite of Cornwall, and especially in that which lies in the Penryn district.

Cornish granite, generally speaking, is much coarser in texture than that found in other parts of the British Isles, and granite having this

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peculiar formation has the advantage of being found in larger and more regular masses or beds than the finer-grained granite of these islands. The composition of Cornish granite also allowed of its being cheaply worked by masons into the various-shaped stones required for large public works, and so in consequence a new industry for Cornwall rapidly sprang up, and till within a few years ago all engineering works of any magnitude on which granite was used were mainly supplied with that material from this county. Cornwall has not only supplied the granite for dock, harbour, and other engineering works in Britain, but has also supplied it for similar purposes to other parts of the world.

When the demand arose for granite blocks, the 'Moormen' first used the boulders which were thickly strewn in the granite districts. They were cut up and exported in the rough or cloven state. These surface stones, however, which were in many cases partially decomposed, were not really suitable, and it was soon realized that the material must be quarried systematically, and from a depth which would ensure sound rock; and further, that the stones should be worked on the spot. Gradually quarries were opened in the most favourable situations, and men were trained to fashion the rough blocks into the required shapes. At first the most primitive appliances were all that were required to quarry and handle the stones, which in these early days were close to the surface. As time went on, and the quarries grew larger, mechanical appliances were introduced, until they culminated in the equipment consisting of the most modern steam cranes, blondins, etc.

The transport of the stone from the quarries to the loading quays was at first carried out by means of teams of horses; but as trade developed tramways and railways were laid down wherever possible, and of late years traction engines have been introduced to supersede the horse on the highways. While the quarries and the transport arrangements were gradually developing, accommodation for storing the dressed blocks preparatory to shipping had to be provided; and this was done by building loading quays, on which at first hand-cranes, and then hand-travellers running on gantries, covering many hundreds of square feet, and latterly steam-travellers covering many thousands of square feet, were erected.

The principal districts in which granite quarrying is carried on are as follows:—

Gunnislake.—This is a considerable pit, and yields a stone remarkable for its white appearance when taken from the better beds.

Kithill.—Situated near the top of the hill of that name. It was extensively worked in the past, but only on a small scale for the last twenty or twenty-five years.

Cheesewring.—This is near the top of Cheesewring Hill, and close to the famous pile of stones which forms a noted landmark. It is a large

quarry, producing a medium-grained stone which has been largely used in many important works. There are extensive openings near this quarry, such as Kilmar and Bearah Tor, which have not been worked for a quarter of a century.

Delank.—This is situated in St. Breward parish near Bodmin, and is one of the most important quarries in the county. The quality of the granite is highly prized, and the present Eddystone Lighthouse was built of the material from this quarry.

Par.—There are several quarries in this district, the most important being Colkerrow and Tregarden. The rocks here are remarkably large, and lie in regular beds. Immense quantities have been exported, as no doubt the cost of production and transit by rail to the shipping port of Par is moderate.

Penryn is the centre of the Cornish quarrying industry. There are scores of quarries near here, the most important being Carnsew, Maen Rock, Rosemenewas, Polkanuggo, Tresaher, and Bosahan, which all produce rock extensively used for engineering purposes. The stone from Carnsew Quarries is much finer in the grain than that procured from the others in this district, and on that account it is preferred for the more important blocks required in docks, bridges, etc. The Fastnet Lighthouse was built of Carnsew granite, and it has been much used for the fronts of buildings, monuments, and decorative purposes. It does not appear that Cornish granite has taken a high position for decorative or polishing purposes, but an extensive polishing works has been in operation at Penryn for some years, and many large contracts have been executed.

Carnmarth and Helston.—There are several quarries in this district; they are situated more inland than those near Penryn, and mostly supply local wants.

Lamorna Cove Quarries are near Penzance. At one time extensive operations were conducted here, but the risk attending shipment, due to the exposed and dangerous coast, led to their abandonment some years ago. Subsequently steam power was introduced, and by that means the stones were hoisted to the top of the cliff, whence they were conveyed to Penzance for shipment. Newmills and Sheffield are also important quarries in this district.

Kithill, Delank, Cheesewring, and some of the Par quarries are connected by tramways or by railroads direct to the shipping ports of Calstock, Wadebridge, Looe, and Par respectively. The various quarries scattered within a radius of from 1 to 6 miles of the shipping ports of Penryn and Port Navis are not connected by rail: the expense of linking up so many quarries, the majority of which are small, has evidently been prohibitive; but, as before stated, traction haulage has been successfully introduced.

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The procedure in quarrying granite is briefly as follows. A suitable position for opening a quarry having been determined on, the subsoil and loose and poor rock are removed. When this is finished, an examination of the joints is made, and the discovery of a good bed or horizontal joint determines the proper position for boring a hole to receive the explosive. The object is to dislodge a mass from its natural position with as little alteration as possible in its form, and it is therefore very important that all obstacles which might impede its free movement should be removed. Any neglect in this respect may result in the rock being shattered. It will therefore be understood that a great amount of judgment and experience is required to quarry successfully, and a hasty or ill-considered operation will most probably result in not only spoiling the rock to be moved, but also cracks may be developed in the rocks remaining *in situ*, and these may lead to trouble later on.

When the rock has been dislodged by the successful firing of the hole, the quarrymen split it up into the smaller blocks to make the various-sized stones required. The splitting is accomplished by steel wedges inserted into numerous small holes drilled by hand across the various faces of the large rock, in such positions and in such lines as are determined by the experience of the quarryman.

The dressing of the blocks for engineering

works, as before mentioned, is done in the quarries; but for building purposes, and for work which requires great care and skill, the dressing is usually done in the dressing yards adjacent to the shipping quays.

Mention has been made of blondins as applied to the quarries. These lifting and transporting machines take their name from the famous acrobat and rope-walker who successfully exhibited his wonderful powers at Niagara Falls. The machine consists of a wire rope stretched across the quarry on which a carriage runs. This carriage can be made to travel to and fro on the rope by means of smaller ropes, which are controlled from a steam winch, conveniently placed so that the driver has an uninterrupted view of the quarry. The carriage has a lifting rope in connexion with it which is also controlled from the steam winch. Such machines command a very wide range, and as they are arranged to work at a high rate of speed they are particularly adapted to quarry work.

It is well known that the tin industry of Cornwall has materially suffered from foreign competition. It appears likely that history will repeat itself, and the granite industry of the county will suffer in the same way. Of late years the vast resources of Scandinavia have been requisitioned. Abundance of granite is found there, in such positions and under such conditions that it is already proving a very formidable rival to the Cornish stone.

SLATE QUARRYING

The slate-quarrying industry of Cornwall has been of importance for at least three centuries, and especially during the last hundred years. Many efforts have been made to trace its history, but no authentic records of its commencement have been discovered. The earliest record found is that of Norden, who, writing in the year 1584, describes Menheniot slate as the best in Cornwall. Carew, writing in 1602 in reference to Cornish roofing slate, is more explicit:—‘In substance thin, in colour fair, in weight light, in lasting strong; and generally carrieth so good regard, as (besides the supply for home provision) great store is yearly conveyed by shipping both to other parts of the realm and also beyond the seas into Brittany and the Netherlands.’¹ Borlase again, writing in 1758 of Delabole slate, says that for lightness and endurance of weather it is generally preferred to any slate in Great Britain, and is perhaps the finest in the world. Sir H. T. De la Beche, F.R.S., says Delabole quarries have long been celebrated for producing a beautiful and durable material combining con-

siderable lightness with strength, and not liable to be damaged by frost. Delabole slate is described by Bishop Watson in his *Chemistry* as the very best in England. In 1865 Frederick Penny, Professor of Chemistry at the University of Glasgow, writes:—‘I have made a scrupulous comparison of the Old Delabole slate with the Welsh, Highland, and Cumberland slates; the results showing that the Old Delabole slate is of very superior quality. It is light in colour, thin and firm in lamination, close and compact in texture, extremely hard, and not easily worn by attrition. In strength and endurance of weather and friction it excels these well-known slates.’ At the time of Borlase and De la Beche there were within six miles of Delabole many small quarries, but they were chiefly worked by small bodies of men. Most of them were worked for only a few years; either the beds of slate rock were small and worthless, or the rock was so unproductive that it could only be worked at a loss. For some years past there have been only two quarries at work besides Delabole—namely, Lanterden and Lambshouse. Both are in the parish of Tintagel.

¹ Carew's *Survey of Cornwall*, p. 20 (ed. 1811).

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The Delabole Slate Quarries are in the parish of St. Teath. They are nearly three miles from Camelford and about two miles from the sea, at an elevation of over 500 feet above the sea level. It is supposed that in the first instance the slate was discovered in the bed of a small water-course at the junction of two rivulets. The land on the east belonged to one owner, on the north to another, and on the west to another. The quarrying was carried on for many years only on the west side. In 1750 several men were at work, and during the following fifty years the quarry became considerably enlarged. At the end of this time also operations had been begun on the north side, which was worked on a lease by twelve quarrymen, who employed others, and about 1844 operations were commenced on the east side. In the earlier period men carried the slate out of the quarry on their backs; then donkeys were employed, as many as forty at one time; later still horses were used, and these were succeeded by a horse-whim. Previous to the introduction of steam power the rock could be worked only to a certain depth, and then as one part was worked out it was filled in with rubble from the new excavations. The first steam engine, named the Speedwell, was erected in 1834 on the west property, and was principally used for drawing rubble over a short incline. In a few years other steam engines were erected on the other properties.

In 1841 a joint-stock company was formed under the name of the Old Delabole Slate Company, for the purpose of working the two quarries on the east and west sides, and in 1849 the quarry on the north side came into their possession. At first the quarries were held on lease, but after a few years the company purchased the freehold of the quarries and a considerable quantity of land, and the three quarries were merged into one. In 1898 the company disposed of their interest to a syndicate, and a new company under the Limited Liability Act was formed under the old name.

The quarry is about 25 acres in extent, and the rubble heaps or spoil banks occupy about 130 more; altogether there are 155 acres. In the early days as the quarry deepened the drainage became a difficulty. About 100 years ago an adit was driven from the valley beneath for nearly half a mile to the quarry, and this carried off the water to the depth of about 200 feet, but when the depth increased a water wheel was erected for pumping the water to the adit, and several years ago two other larger wheels were added, which are driven by water from the surface, and are so arranged that the water passes over each. When the surface supply is not sufficient in summer to keep the wheels going, steam is used for working the pumps. After the introduction of modern machinery the following method was adopted

for hauling the top-rock and slate-rock to the surface: Parapet-heads, or poppets as they are locally called, were employed, which consisted of strong wooden stays secured at one extremity to the surface, and projecting 14 feet over the edge of the quarry; these were furnished at the other extremity with a pulley, over which the chain used for hauling was passed. One end of this chain was wound round a cage or drum near the engine-house, while the other, after passing over the pulley, was left free so that it could be taken to that part of the quarry from which the rock was being extracted and attached to the load. Afterwards, when the parapet-heads were discarded, wire ropes were substituted for chains, the ropes being found cheaper, stronger, and more durable. In place of parapet-heads inclines have now been constructed, and the rock and rubble are hauled in wagons over them to the surface by means of stationary engines at the top.

The operations in the quarry are as follows:— Powder is usually used for blasting the ordinary rock, but for hard and unproductive rock dynamite is sometimes used, and the men who do the blasting are called rock men. If the rock is useless the payment is by the ton, if slate-producing it is by the dozen for roofing slate or by the foot for slabs. After being blasted the rock, whether good or bad, is taken in charge by men called fillers, who load the wagons and send it over the inclines or the parapet-heads, whence it is received by men called landers, and then taken by locomotive engines, the useless to the waste tip, and the good to the deposit floors or to the manufacturing sheds. At the sheds the men called splitters or cleavers take charge of those blocks which are to be converted into roofing slates. By means of a mallet and flat chisel the blocks are split into slabs 2 in. or 3 in. thick, and if too wide to work to advantage they are placed on a circular saw-table and sawn at right angles to the *cleavage*, and then further subdivided into the required thickness. Then the several pieces are passed to the slate-dresser, who cuts them into the largest sizes they will make. The slates are then taken charge of by men called pitchers, who sort them, placing each kind by itself. The foreman takes the count, and the men are paid according to his return. Whatever damage is done before the count takes place is at the loss of the men.

A considerable quantity of slate is made into what is called scantle, which is squared both sides and at one end, and is irregular in length and breadth. About 700 scantle slates are required to do a square (i.e. 100 superficial feet) of roofing. These are used principally in West Cornwall and Belgium. Many years ago a number of churches in Devon and Cornwall were covered with them. A large quantity of another kind is made, called rags. They are like scantle, irregular

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in length and breadth, and are squared both sides and at one end, but are much larger, only about 130 being required to a square. These until recently were used for cattle sheds and farm buildings. The slater in using the scantle and rags has to shape them according to requirements. The rags make a stronger roof than sizes, being thicker and generally rather coarser. The roof does not present so even a surface as when made of sizes, and this is a feature which some architects have of late years been favouring. During the last five years they have been used in various parts of the country on large buildings not of the class named. Slate is used for many purposes besides roofing, such as floors for kitchens, halls, and lighthouses, for dowels to connect granite blocks in lighthouses, for window sills, corn chests, brewers' vats, ridge rolls, urinals, chimney-pieces, and for water cisterns up to 2,000 gallons. These goods are prepared in sheds which are distinct from those for the manufacture of roofing slate, and furnished with the necessary sawing machines, planes, and other appliances.

The veins or beds of slate-rock run in various thicknesses, from 2 ft. to 10 ft. with a dip from east to west of about 3 in. in a foot, with a slight inclination from north to south. In some beds a small quantity of quartz is found mixed with the slate, and sometimes this prevails to such an extent as to render the slate useless for commercial purposes. The colour of the slate is grey blue, and the quality continues to be good and quite maintains its former prestige. Twelve and a half cubic feet weigh one ton.

The number of persons employed from time to time has varied. In 1850 it was about 600. Five years later a reduction took place by the discharge of the women and girls who up to that time had been employed as slate-splitters. In justice to the women it may be said that as regards ability they were equal to the men. Up to 1871 the number of employes had nearly reached 600, but in that and the two following years the number was reduced to 466, and with slight variations so it has continued, the number at the present time being 463.

The output of rubble and rock has varied considerably from time to time. The earliest date for which it can be given is 1873, when the total quantity was 242,146 tons. In 1880 it was 359,549 tons, which is the largest on record. In 1893 it was 147,093 tons, and in 1903 it was 274,105 tons. The value of the products for the past three years may be reckoned as approaching £34,000 a year. The price has varied considerably during the last 50 years, and has quite if not more than doubled.

There are now eight stationary steam engines, two of which are used for hauling rubble and rock over the inclines. Arrangements are in progress for adding another engine to the main incline, which is about 1,000 ft. long, and has

an inclination of 5 in 12. One engine will continue to be used for hauling to the parapet-head, one for pumping water, and three for driving the machinery in the manufacturing sheds and in the engineering, carpenters', and smiths' shops. Two locomotives take the wagons to the manufacturing sheds and rubble tips. Cranes and derricks are used in various parts of the works.

The general method adopted in the production of roofing slate, in the working department, is as follows:—The men who blast or raise the slate-rock in the quarry and the splitters and dressers in the sheds are partners and usually share equally, so that the more care and good judgement, exercised in preparing the blocks the better for each man, and also for the shareholders. Many comparatively rough blocks are refused by the contract men, and these are passed on to men and boys called cullers, who are paid a fixed price, and make as much out of them as they can. The sawing and planing are paid for by the foot. Filling the wagons in the quarry, landing at the parapet-heads and incline, and tipping at the deposit end are performed at so much per ton. Everything taken from the quarry passes over a weighbridge. A quarryman's wages average about 21s. per week. Fillers and others earn about 17s.

It should be observed that it is only during the last fifteen years that circular saws have been gradually introduced for cutting the large pieces of slate, which is done at right angles to the cleavage, after they have been divided into thicknesses of two or three inches. When the saws are not used the slate is cut by a process called flerrying. In this the stone is laid flat, and with a gouge a small groove is chipped in one side; a chisel is then placed in the centre of the groove and is struck with the hammer until the effect of the blows is seen in a small crack dividing it into two pieces. The disadvantage of this method is that the split frequently goes in the wrong direction and waste follows. This plan is still pursued to some extent at Delabole, and altogether in the other two quarries. Until the introduction of saws it was the only method employed in this and all other quarries in Cornwall. So far no machinery has been introduced for the splitting of slate, but slate-dressing machines have been used for some years at Delabole, and are now in general use.

Previous to the construction of the London and South Western railway line to Wadebridge, the slate, sent by water, was shipped at Port Gavorne, about five miles distant from the quarry. The wagons were brought alongside the vessels, and the slate was passed from the wagons to the vessel by women and men. Sixty years ago the wagons were drawn by two bullocks and a horse, afterwards by horses owned principally by small farmers, who did this in connexion with their farm work. The London and South Western

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Railway station is within a few yards of the quarry banks where the slates are pitched, and a siding runs into that part. Since the line was opened to Wadebridge and Padstow all the slate sent by water has been conveyed by rail and shipped from one or other of those places.

Lanterden Quarry is near Trebarwith Strand, on the north side, in the parish of Tintagel. It was opened more than two hundred years ago, and judging from its size many men were employed when it was first opened, but for the last sixty years only three or four have been working there. A windlass worked by hand is used for raising the slate to the surface, and the top rock and waste are deposited in the old workings.

Lambshouse Quarry is also in the parish of Tintagel, on the glebe there, and about half a

mile south of King Arthur's Castle. It was opened more than one hundred years ago, and has been worked by different persons with varying success. It was closed for several years. In 1855 it was reopened, and has been worked continuously since that time. The average number of hands employed has been about twenty, but at present the number is forty-two. A steam engine and a horse-whim are used for raising the slate, and the unproductive rock and the waste are thrown over the cliff into the sea. The shipments are made at King Arthur's Castle, but some of the slate is also dispatched from the London and South Western Railway station at Camelford. The methods of raising the rock and preparing the slate for the market are the same as those which are adopted in other quarries.

TIN MINING

The antiquity of British tin,¹ and the supposed voyages to Cornwall of the Phoenicians, have been too long the subject of antiquarian research² to need further elaboration. As the Isles of the Cassiterides, Cornwall appears to have been visited as early as 1000 B.C.³ by Phoenician or by Iberian or Gallic traders,⁴ who acted as distributing agents for its tin throughout the known world, some going even as far as the Indies.⁵ Diodorus Siculus describes Britain as triangular. The promontory nearest the mainland was Cantium (Kent), that at the opposite extremity Bolerium, and that turned toward the sea Orca. The inhabitants of Bolerium were hospitable, and, on account of their intercourse with strangers, civilized in habits. They it was who produced tin, which they melted into *astragali*, and carried to an island in front of Britain called Iktin,⁶ a peninsula at low tide, where they transported the tin in carts from the shore. Here the traders bought it and carried it into Gaul,

across which it was taken on horseback in about thirty days to Marseilles.⁷

Of the Romans in Cornwall no written records are extant, and it is doubtful if they meddled with the mines there during their stay. Great variety of opinion, however, exists on this question. It certainly seems strange that the Romans, aware of the richness of the tin mines, and accustomed to dealing with other metals in the same island,⁸ should have neglected to exploit the stannaries. But the few Roman remains in Cornwall suggest trading posts only;⁹ and although some have professed to see traces of Roman occupation in the circular earthworks surrounding some of the old mines,¹⁰ it is far more likely that these were erected by the Cornish to guard their secrets from alien traders.¹¹

The Anglo-Saxon régime in England was, until Athelstan's conquest of Cornwall in 937, contemporaneous with the existence of an independent Cornish kingdom of native Celts, under which the stannaries, although probably hampered by the three-cornered struggle of Saxon, Dane, and Briton,¹² continued in operation. Saxon ornaments and coins have been

¹ 'The Antiquity of Mining in the West of England,' by R. N. Worth, *Journ. Plymouth Inst.* v, 133-135.

² For the more important treatises see Geo. Smith, *The Cassiterides*; R. Edmonds, *On the Phoenician Tin Trade with Cornwall*; 'The Tin Trade of Antiquity,' by 'L,' *Notes and Queries*, 2nd series, v, 101; G. C. Lewis, *Historical Survey of the Astronomy of the Ancients*, 450-457, 481-482; 'The Sources and Supply of Tin for the Bronze Tools and Weapons of Antiquity,' by J. Crawford, *Trans. Ethnological Soc. of London*, iii, 350-356.

³ Geo. Smith, *The Cassiterides*, 43.

⁴ 'The Tin Trade of Antiquity,' by Hyde Clark, *Notes and Queries*, 2nd series, v, 287; 'The Ancient Cornish Tin Trade,' by C. D. Saunders, *Rep. Roy. Cornw. Polytechnic Soc.* 1865, 42-45.

⁵ Geo. Smith, *The Cassiterides*, 23.

⁶ For the propriety of this name see R. Edmonds, *On the Phoenician Tin Trade with Cornwall*, 8.

⁷ Diodorus Siculus, v, c. 21, 22.

⁸ They are known to have worked the lead mines. W. H. Pulsifer, *Notes for a History of Lead*, 27, 28; Robt. Hunt, *British Mining*, 27 et seq.

⁹ 'The Romans in Cornwall,' by Otho Peter, *Journ. Roy. Inst. Cornw.* xv, 11.

¹⁰ 'The State of the Tin Mines at Different Periods before the Eleventh Century,' by J. Hawkins, *Trans. Roy. Geol. Soc. Cornw.* iv, 72.

¹¹ 'The Romans in Cornwall,' by Otho Peter, *Journ. Roy. Inst. Cornw.* xv, 11; 'The Romans in Cornwall,' by J. B. Cornish, *Journ. Roy. Inst. Cornw.* xiii, pt. 4, 430-434; R. Polwhele, *Hist. of Cornwall*, i, 175.

¹² Lysons, *Magna Britannia*, iii, pp. xi, xii.

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found in the St. Austell tin grounds;¹ statements are extant that the Saxons carried tin to France in the seventh century, and sold it at fairs established by Dagobert;² while in the Life of St. John of Alexandria, who died in 616, is the story of an Alexandrian galley which journeyed to Britain and bore away a load of tin.³

For the most part, however, the mines during the early Middle Ages are as a sealed book. Nowhere are they mentioned in Domesday, which, considering that this contains references to the iron⁴ and lead⁵ mines of the kingdom, Mr. Hunt has explained by the fact that tin was considered royal property, and so not likely to be noted in a survey projected to ascertain the value of the country for purposes of taxation.⁶ This explanation should be taken with caution; for a century later, as we know, the tin mines were not royal property in the sense of being exempt from taxation,⁷ but paid a round tax as the price of their existence. A more probable reason for their not figuring in the Domesday Book would be the possible fact that at that time, as later, the prerogatives over the mines were exercised by some baron, possibly the earl of Mortain, or, what seems most unlikely, that from 1086 to 1156 the stannaries were extinct.⁷ Whatever the true hypothesis, it is not until the latter date that the history of Cornish mining may be said to have begun.

Here it may be well to offer a few words of premonition, in view of the account which is to follow. The usual conception of a history of mining, that of a history of picks and shovels, drainage engines and smelting furnaces, is at fault when one goes back for an account of it to the Middle Ages. Few subjects are so little known or appreciated as the story of the rise and progress of the mediaeval free miner, the liberties which guaranteed him his position, and the relation in which he stood to the rest of the community. This type of workman (and here what we say applies not only to the English miner but to the German, French, Austrian,

Scandinavian, and Flemish⁸ as well) formed with his fellows of the district a state within a state. He paid taxes, not as an Englishman, but as a miner. His law was not the law of the realm, but that of his mine. He obeyed the king only when his orders were communicated through the warden of the mines, and even then so long only as he respected the mining law. His courts were the mine courts, his parliament the mine parliament. He owned no lord, lived on no manor, paid no dues, was subject to no feudal levy, and might be called out by the king only under important restrictions.

The origin of these privileges is obscure. Excluding England, two theories prevailed in the Middle Ages with regard to property in mines.⁹ By the first, the sovereign was looked upon as absolute proprietor, and the landowner had no rights, save to indemnity for property damaged. By the second, ownership of the surface carried with it a right to the mines beneath, but a third person was given power to acquire an interest when the owner was unable or unwilling to exploit them. In both cases the enjoyment of mines was subject to regulations from the crown, which also commonly established a claim to one-tenth or other proportion of the produce, so that in practice the two theories might coincide.

In Germany¹⁰ the idea of a royalty in mines is supposed to have made its first appearance, and to have obtained firmest footing; but even there no claims appear until the close of the eleventh century,¹¹ when the revival of Roman law co-operated with the assumed succession of the German crown to the rights of the Caesars, to give currency to the claims of sovereignty over mines. According to the Justinian Code,¹² one might work a gold mine upon condition of conforming to certain regulations, and of giving preference in sales to the imperial fisc. By a constitution of Gratian,¹³ also, a general permission had been given to take marble from the land of private persons upon payment of a tenth to the owner. The interpretation of these rules

¹ 'Saxon Ornaments and Coins found at Trewhiddle,' by J. J. Rogers, *Journ. Roy. Inst. Cornw.* ii, 292.

² Macpherson, *Annals of Commerce*, i, 288; 'The Men who made the Cornish Mines,' by J. B. Cornish, *Journ. Roy. Inst. Cornw.* xiii, pt. 4, 434.

³ 'The Tin Trade of Britain and Alexandria in the Seventh Century,' by E. Smirke, *Journ. Roy. Inst. Cornw.* ii, 283-291.

⁴ H. Ellis, *Dom. Bk.* i, 136-138.

⁵ *Ibid.* i, 138.

⁶ 'Notes on the Remains of Early British Tin Works,' by Robt. Hunt, *Gentleman's Magazine*, xiii, 701.

⁷ 'The Men who Made the Cornish Mines,' by J. B. Cornish, *Journ. Roy. Inst. Cornw.* xiii, pt. 4, 431-432.

⁸ The Belgian miners presented certain exceptions to the general rule, which, however, it is not worth while to discuss in this paper. On this subject see Smirke, *Vice v. Thomas*, App. 86, 112; Delebecque, *Législation des Mines*, i, 141; Jars, *Voyages Métallurgiques*, i, 371-381, 382-402; De Louvrex, *Recueil des Édits*, pp. 228 et seq.

⁹ 'A Sketch of the Origin of Mining Laws in Europe,' by J. Hawkins, *Trans. Roy. Geol. Soc. Cornw.* vi, 84-90.

¹⁰ 'Observations on the Mining Law of Germany,' by C. Lemon, *Trans. Roy. Geol. Soc. Cornw.* vi, 150-172.

¹¹ Hüllman, *Geschichte des Regalien*, 62; Eichorn, *Deutsche Staats und Rechtsgeschichte* (ed. 1834), ii, 424.

¹² Lib. xi, tit. 7b.

¹³ Lib. xi, tit. 7, l. 3; Theodosian Code, b. x, tit. 19, ll. 1, 8, 10, 11, 14.

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by the Lombard commentators¹ made them applicable to mines of all descriptions and in all countries, and the German emperors in the twelfth century succeeded in enforcing their pretensions and in taking all mines under their peculiar care.²

It was found, however, that attempts to treat the miners as so many agricultural labourers would be disastrous. The technical difficulties connected with mining made it essential that the men be secured from interruption, and also that skilled workmen be called in by special grants of privileges. The upshot was that the emperor, and his imitators, the lesser princes, gradually commuted their mining rights for a proportion of the produce, and threw open the mines to all comers under a series of charters,³ the provisions of which we shall find exemplified, in the main, by those of the Cornish tanners. Germany's policy was followed some centuries later by France, the edicts of Charles VI⁴ and Louis XI⁵ removing the miner from the power of the landlords, and granting privileges to prospectors. Even Norway and Sweden appear at an early date to have regarded the mining classes as of a special status.⁶

In England, in the same general period, we meet with similar codes, applied, however, not to all mines, but to several scattered mining communities—the lead miners of the Mendip Hills,⁷ Derbyshire,⁸ and Alston Moor,⁹ the iron and coal miners of the Forest of Dean,¹⁰ and the tanners of Cornwall. It would simplify matters could we regard these codes as descended from Roman law, as was probably the case upon the

continent. This, however, is not easy to prove. The early references to the English miners' privileges give the impression of unwritten law, arisen through custom, rather than of rights formally conferred by charter.¹¹ In Derbyshire the lead-miners' customs rested on immemorial usage,¹² to which Edward I in 1288 merely affixed his confirmation.¹³ In Dean the law 'used time out of mind' was but restated in the so-called mine charter of 1286.¹⁴ The Alston miners received a charter from Henry V;¹⁵ but, again, nothing was granted that had not been previously enjoyed. What also seems strange is that, although these mining camps were operated under conditions of great liberality to the adventurer, all mines outside their limits should be the property of the king¹⁶ or of the landlord.¹⁷ This is no place for a dissertation upon the general subject of the origins of English mining law; but I may here state my opinion, formed after a study of the sources, that, while the king unquestionably tried to imitate the continental sovereigns in claiming all metallic mines,¹⁸ this pretension was never permanently established except for the precious metals, other mines, as a rule, remaining the property of the ground-lord.¹⁹ Under these circumstances, the existence, under peculiar mining codes, of several isolated tracts well known to be the seat of the oldest mines in England, seems due, not to any engrafting of Roman law from the continent, but, as the miners themselves declared, to usage time out of mind.

It has been stated that the authentic history of the tin mines begins with the year 1156. The earliest entries are but brief items in the Pipe Rolls,²⁰ but in 1198 appears a letter²¹ from

¹ See extracts from the Gloss of Accursius and the Summa of Azo, printed in E. Smirke, *Vice v. Thomas*, App. 104.

² See charters of mines, printed in the *Spicilegium Ecclesiasticum*, Luenig, *Reichs Archiv.* and cited by J. F. Gmelin, *Geschichte des Deutschen Bergbau*, 220, 241.

³ See F. L. von Cancrin, *Grundsätze des Deutschen Bergrechts*, 149. A specimen charter is that of Iglau, Peithner, *Versuch über die Natürliche und Politische Geschichte der Böhmisches und Märischen Bergwerke*, App.; Jars, *Voyages Métallurgiques*, iii, 461–511; Reyer, *Zinn*, 35, 53, 54, 56, 79.

⁴ *Recueil des Anciennes Lois Françaises*, vii, 386–390.

⁵ *Ibid.* x, 623; 'The Mining Laws of France,' by M. Migneron, *Trans. Roy. Geol. Soc. Cornw.* vi, 239–258.

⁶ Swank, *Iron in all Ages* (ed. 2) 29; 'A Sketch of Mining Law in Germany and other Countries,' by C. Lemon, *Trans. Roy. Geol. Soc. Cornw.* vi, 171–172; Jars, *Voyages Métallurgiques*, i, 403–416; Héron de Villefosse, *De la Richesse Minérale* (Extrait par M. Patrin, 1811), 40–41.

⁷ Houghton, *The Compleat Miner*, pt. iii.

⁸ Esch. Enr. Accts. 16 Edw. I, No. 34; Add. MS. 6682, fol. 65; *Compleat Mineral Laws of Derby*.

⁹ Pat. 4 Hen. V, m. 8; 30 Edw. I, pt. iii, m. 23; *Parl. R.* (Rec. Com.) i, 64.

¹⁰ Houghton, *The Compleat Miner*, pt. ii; Nicholls, *The Forest of Dean*.

¹¹ 'The Origins of Mining Law,' by J. Hawkins, *Trans. Roy. Geol. Soc. Cornw.* vi, 90.

¹² It is said that William the Conqueror expressly refrained from disturbing them. Add. MS. 6682, fol. 197.

¹³ Esch. Enr. Accts. 16 Edw. I, No. 34.

¹⁴ Nicholls, *The Forest of Dean*, 17.

¹⁵ Pat. 4 Hen. V, m. 8.

¹⁶ As in the case of mines royal (*Pipe R. of Cumb. Westmld. and Dur.* Introd. xxiv–xxvi, Fines, 18 Edw. II, m. 15; *Cal. of Pat.* 1300, 502; 1461, 19; Plowden, *Commentaries* (ed. 1761), 310 (Case of Mines); Ruding, *Annals of the Coinage*, i, 124 et seq.).

¹⁷ As in the coal mines in the north (Galloway, *Annals of Coal Mining and the Coal Trade*, 18, 21, 23, 24, 27, 37–39, 44, 59, 69, 73; Patrick, *Early Mining Records of Scotland*, Introd. xlv).

¹⁸ Dugdale, *Mon.* (ed. 1846), ii, 289 (grant by Rich. I to the bishop of Bath); *Cal. of Pat.* 1283, 73 (grant of lead mines to the Carthusian monks).

¹⁹ Plowden, *Commentaries* (ed. 1761), 310 (Case of Mines).

²⁰ *Pipe R.* 2 Hen. II, Devon, and for the following years. It is probable that these entries comprised both the Devon and the (then) less important Cornish stannaries.

²¹ Black Book of Exchequer, No. 10.

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the warden of the stannaries to the justiciar, by means of which we may deduce the previous position of both mines and miners. In 1156 the production of tin was small, and for the most part confined to western Devon. From 1156 to 1160 the tax on output, 30d. per thousand-weight in Devon and 5s. in Cornwall,¹ was farmed by the sheriff of Devon for an annual sum of £16 13s. 4d.,² revealing a production of about 133 thousand-weight of tin.³ During the succeeding decades the farm was raised to keep pace with the increasing output, which, if we retain our previous criterion of estimate, rose to 183 thousands in 1163,⁴ 533 in 1169,⁵ and 640 in 1171.⁶ The miners themselves were, as yet, not far removed in social status from the villeins, being probably subject to the same customary payments and services, owing suit to the manor and hundred courts, and probably varying their underground pursuits with that of farming. Around the industry, however, had already grown a customary law, and of this the provision which more than any other tended to elevate the tinner above the ordinary labourer was the so-called right of bounding⁷ or of freely searching for tin wherever it might be found regardless of landlord. Had it been otherwise, and the mine been the perquisite of the owner of the soil, probably nothing could have saved the stannaries from a régime of semi-slavery such as disgraced the Durham coal mines,⁸ and lasted in Scotland until 1799.⁹ As it was, any man who would might own a freehold tin mine by the simple process of 'staking out a claim.'

The government of the stannaries had been confined chiefly to the collection of the annual tax; but in 1198 the tin mines of both countries were placed under the supervision of a warden (De Wrotham) appointed by the king. De Wrotham's innovations had still to do with the question of taxation. He convened juries of miners from the two shiremoots,¹⁰ and by their aid rectified the weights for the official measurement of tin slabs on occasion of the collection of the tax. He imposed a further tax of a mark per thousand-weight, and for the collection and

safe-keeping of both instituted a bureaucracy of collectors and check-clerks, together with a code of regulations calculated to bring all tin under the view of the king's servants. The production had now risen to 900 thousand-weight,¹¹ which, under the new system, yielded the king a revenue far greater than all Cornwall, the mines excepted.¹²

The supply of metal, however, in the year 1200 had fallen to 800 thousand-weight,¹³ and it may have been to sustain the industry which brought him such profit that John in 1201 issued their first charter to the stannaries.¹⁴ Its provisions were brief, but important. It confirmed the ancient privileges of bounding, and of fuel and water, and, most important of all, removed the tanners from all pleas of serfs. Over them no magistrate had jurisdiction save their warden, who alone, or through his officers, might summon them from work for civil and criminal matters. This charter was followed after a few years by a decided increase in production; the supply of tin, which from 1201 to 1209¹⁵ had fallen to 600 thousand-weight per annum, touching 800 in 1211,¹⁶ 1,000 in 1212,¹⁷ and two years later the record yield of 1,200 thousand-weight, or about 600 long tons.¹⁸ But the disastrous effects of the new charter upon the manorial lords, offering as it did complete freedom to any villein who would turn miner, brought about its practical revocation at the instance of the barons. Devon had been disafforested in 1204,¹⁹ and in 1215 John restored to the men of Cornwall the liberties which they had enjoyed under Henry II, promising that no one should lose the services of his men, whether or no they dug tin.²⁰ In the following reign, however, the charter was solemnly confirmed to the miners,²¹ and, inasmuch as, even before, we find the tanners of Devonshire in possession of a court,²² it is a question whether, after all, the provisions of the stannaries' charter were ever in practice wholly abrogated.

The thirteenth century has left little evidence as to the administration of the stannaries, for the reason that, beginning with 1215, the king resumed the practice of farming them for a lump

¹ Black Book of Exchequer, No. 10.

² Pipe R. 2-6 Hen II, Devon.

³ The thousand-weight of 1,200 lb.

⁴ Pipe R. 9 Hen II, Devon.

⁵ Ibid. 15 Hen. II, Devon.

⁶ Ibid. 17 Hen. II, Devon.

⁷ For the rules governing bounding in later years see Pearce, *Laws and Customs of the Stannaries*, *passim*; *The Laws of the Stannary of Devon*, (ed. 1575).

⁸ Dur. Cursitores Rec. 23 Hatfield, No. 31, m. 4d.; 29 Hatfield, No. 31, m. 5d.; Galloway, *Annals of Coal Mining and the Coal Trade*, 269.

⁹ Patrick, *Early Mining Records of Scotland*, xlvi, lxxv.

¹⁰ This proves the non-existence, as yet, of stannary courts.

¹¹ Chanc. R. 1 John, Cornw.

¹² Pipe R. 2 John, Cornw.

¹³ Ibid.

¹⁴ Chart. R. 36 Hen. III, m. 18.

¹⁵ Pipe R. 8-9 John, Cornw.

¹⁶ Ibid. 13 John, Cornw.

¹⁷ Ibid. 14 John, Cornw.

¹⁸ Ibid. 16 John, Cornw.

¹⁹ Chart. R. 5 John.

²⁰ Chart. R. 16 John, m. 2. The process had been partially inaugurated in Cornwall in 1204 (Chart. R. 5 John, m. 9).

²¹ Chart. R. 36 Hen. III, m. 18.

²² Pipe R. 27 Hen. III, Devon. Apparently, however, the tanners of Dartmoor at least were not wholly emancipated in 1250. See Lysons, *Magna Britannia*, vi, p. cclxxx, citing Pat. 35 Hen. III.

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sum,¹ thus removing them from the subjects embraced by the Pipe Rolls and similar state documents. From 1225 to 1300 Cornwall, with its stannaries, was under the earls Richard and Edmund,² whose ordinances and regulations, if any, have completely disappeared. It is necessary to emphasize this point, in view of the statement so frequently seen in the older histories of Cornwall, that the two earls gave the tinnerns charters of privilege which in 1305 were merely confirmed by the king.³ No evidence exists to verify this assertion, and there is almost positive proof of its falsity, to say nothing of the fact that, possessing as we do the earlier stannary documents, it is well-nigh incredible that we should find no trace at all of a charter, which, if issued, must have been of vast importance; the reason for the charter of 1305 becomes clear enough when we examine the petition of the Cornish tinnerns in 1304, namely that they have their charter of liberties not conjointly with the men of Devon, 'juxta confirmationis Regis Henrici.'⁴ This can refer only to the confirmation in 1252 of John's charter,⁵ and the fact that the latter is here referred to as the great charter of the tinnerns is evidence that no grants of importance were made in the intervening period.

The administration of the stannaries probably varied little all this while from the system instituted in 1198. A few minor changes took place in the fiscal bureaucracy, while the appointment of a warden was sometimes accompanied by that of one or more 'clerk-wardens'⁶ who in all likelihood performed the warden's work, while he himself, often as well the farmer of the stannaries, remained in London.⁷

The issue of the charter of 1305, at which date the Cornish stannaries were partially separated in administration from those of Devon,⁸ marks an important step in stannary government, not merely because it contained new features, but because, with one addition, it remained from

that day till less than a century ago the constitution of the tinnerns. To analyse it briefly, it confirmed the customary rights of bounding, freed the tinnerns from ordinary taxation, confirmed the already existent practices of tin coinage and pre-emption, and attempted rather unsuccessfully to give precision to the jurisdiction of the warden and his lieutenants.

This charter almost completing as it does the list of the tinnerns' privileges, a slight digression may here be made to describe them more fully. Bounding has been referred to as the basis of the superior status of the free miner⁹; but this liberty was qualified by restrictions. A limitation existed as to the kinds of lands which might be invaded, and, secondly, the owner of the soil was entitled to compensation. Cornish law, after excluding highways, houses, and churchyards from devastation, allowed any man to dig for tin in all wastrel,¹⁰ and in enclosed lands, if the latter were of the duchy manors, or had been anciently bounded and assured for wastrel.¹¹ Anywhere else the owner's consent was requisite. The bounds were tracts of land enjoyed by their possessors in respect to tin only, and the ceremony of taking up a claim¹² was the digging of a small pit, and the making of a small pile of turf at each of the corners of the plot.¹³ This had to be repeated each year, else the bounds were said to have lapsed.¹⁴ The laws of the stannaries contain no provision regulating the amount of land which might be included in a pair of bounds, and a possible outcome of this omission is seen by the fact that in 1786 all Dartmoor, comprising 5,000 acres, was taken by a single bounder.¹⁵ Nor has there ever been any definition of the work necessary to hold the bounds, with the possible exception of one which made toll tin obligatory at the end of the third year,¹⁶ else the land reverted to its lord. The taking up of new bounds, as well as the renewing of old ones, had, after 1495 at least,¹⁷ to be reported at the nearest stannary court, where, having

¹ Pat. 1 Hen. III, m. 5; 4 Hen. III, pt. i, m. 1; 5 Hen. III, m. 4, 6, 8; 8 Hen. III, m. 11; 19 Hen. III, m. 16; 37 Hen. III, m. 18; Close, 1 Hen. III, m. 23; 5 Hen. III, m. 8; 6 Hen. III, m. 3; 8 Hen. III, m. 14; 9 Hen. III, m. 4; 10 Hen. III, m. 27. Fine, 5 Hen. III, m. 7; 6 Hen. III, m. 2. *Cal. Orig. R.* (Rec. Com.), 38 Hen. III, r. 3; 32 Edw. I, r. 7.

² Close, 9 Hen. III, m. 7, 9. *Chart. R.* 15 Hen. III, m. 4.

³ Carew, *Surv. of Cornw.* (ed. 1811), 17. De la Beche, *Geology of Cornw. Devon and West Somers.* 526.

⁴ *Parl. R.* (Rec. Com.), i, 164.

⁵ *Chart. R.* 36 Hen. III, m. 18.

⁶ *Chanc. R.* 3 John, Cornw. *Pipe R.* 11 John, Cornw.

⁷ Pat. 9 John, m. 16.

⁸ *Chart. R.* 33 Edw. I, m. 40, 41. Duplicate charters were issued to the two stannary counties, and save for both being subject to the warden, they remained separate from that day onward.

⁹ The right of bounding was universal in all free mining communities. Cf. Houghton, *The Compleat Miner*, pt. iii, art. 1.

¹⁰ *Terris vastis et moris* in the charter of 1305 is obviously 'wastrel lands and moorlands.'

¹¹ *Convoc. 12 Chas. I, c. 4.* Cf. also *Compleat Mineral Laws of Derb.* pt. i, art. 12.

¹² In Derbyshire the prospector applied for his claim to the barmaster, who delivered him two 'meers.' *Compleat Mineral Laws of Derb.* pt. iii, art. 1.

¹³ *Harl. MS.* 6380, fol. 27.

¹⁴ The law, however, still allowed the old occupant to retain his shaft, provided it be not extended laterally (*Harl. MS.* 6380, fol. 30). As the custom of bounding survives largely in modern mining law, I have set down only the more salient features.

¹⁵ 'The History of the Custom of Tin Bounding,' by E. Smirke, *English's Mining Almanack*, i, 156.

¹⁶ *Harl. MS.* 6380, fol. 30.

¹⁷ *Smirke, Vice v. Thomas*, 101. *Add. MS.* 6713, fol. 101-104.

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been there proclaimed at the three following sessions, in default of opposition, the boulder's title became valid.¹

The mediaeval tinner had also the right of access to running water,² without the use of which to cleanse the ores mining would have been impossible. In the miners' charters this right appears as that of diverting streams,³ and served not only to permit the washing of ore, but also to lay bare the river beds for searching for stream tin.

With the above privilege went that of buying brushwood for smelting purposes,⁴ amounting, doubtless, to a right of seizure in case the owner refused to sell. In an age when pit coal was rarely used in the metallic industries, this was a concession of importance, especially in view of the fact that the barrenness of the Cornish moors made it difficult to procure a sufficient stock of fuel. Partly in consequence of this, and partly because of the approaching exhaustion of the Cornish peat beds, the tanners were permitted to cut turf in the royal forest of Dartmoor. For Devon this right probably derives its sanction from a custom as old as bounding,⁵ but it was not enjoyed by Cornwall until 1465.⁶

In Cornwall, the claims of the lord of the soil in which a mine existed were satisfied by the payment of a fixed proportion of the ore on the day of the 'wash' or ore-dressing, when a servant of the landlord, known as the 'toller,' met the tanners, and received his master's share in kind.⁷ The proportions of toll were not uniform throughout the stannaries. The tenth⁸ or fifteenth dish was usually given, but this depended partly on local custom, and partly upon special enactment of the stannary convocation,⁹ a general rule prevailing that wastrel land should pay less than arable. In lieu of toll the landlord might receive a share in the mine itself,¹⁰ a

practice, however, more frequently to be found in Derbyshire¹¹ or in the Forest of Dean.¹²

Doubt exists as to whether or no the miners were subject to impressment for work in the royal mines or elsewhere. We find undoubted grants of exemption from forced labour,¹³ but, on the other hand, besides several royal writs and letters which call upon the sheriffs of Devon and Cornwall to furnish workmen for the king's mines,¹⁴ positive evidence from at least one Receiver's Roll for the Duchy of Cornwall shows that tanners were occasionally made to work at the king's wages,¹⁵ a hardship which in Derbyshire,¹⁶ Mendip,¹⁷ and the Forest of Dean¹⁸ was taken quite as a matter of course. In addition we know that the tanners were frequently called upon for special military service, the sole condition being that they be impressed by and with the consent of the warden,¹⁹ and mustered separately from the rest, under his command,²⁰ a custom which has as a result one of the provisions of the Militia Act of 1802.²¹

The remaining privileges, those of exemption from the jurisdiction of any but the stannary courts and from the incidence of ordinary taxation, deserve less summary treatment, inasmuch as they are connected with stannary institutions of a similar nature.

The clauses in the charter of 1201 which placed criminal and civil jurisdiction over the tanners in the hands of the warden had resulted in the division of the mining districts of Cornwall into several distinct provinces or stannaries.²² The local limits of each of the four stannaries have never been defined. They probably grew up from this general grant of jurisdiction, which we find to have been usual in other mines,²³ and which, perhaps, constituted a mixed personal and local law. The character of the locality seems to have resulted from the aggregation of the tin works in certain situations favourable to them, and the name of each stannary points out

¹ Harl. MS. 6380, fol. 31. P.R.O. Ct. R. bdle. 161, No. 18.

² Chart. R. 33 Edw. III, m. 40. For the custom in Derbyshire see *Compleat Mineral Laws of Derby*, pt. i, art. 2, 9.

³ 'Et divertere aquas ad operationem eorum' (Chart. R. 33 Edw. I, m. 40, 41).

⁴ The king's miners had like privileges (*Cal. of Pat.* 1283, 69; *Cal. of Close*, 1333, 152; 1337, 190; 1339, 286). Similar liberties prevailed in the Forest of Dean (Houghton, *The Compleat Miner*, pt. ii, art. 26, 28, 29, 34), and in Derbyshire (*Compleat Mineral Laws of Derby*, pt. i, art. 11; Add. MS. 6682, fol. 68).

⁵ Pat. 1 Hen. III, m. 5; Close 3 Hen. III, pt. i, m. 9 d, 23.

⁶ Pat. 5 Edw. IV, pt. ii, m. 7.

⁷ Pearce, *Laws and Customs of the Stannaries*, p. xix.

⁸ In the Mendip mines the lord received the tenth dish. (Houghton, *The Compleat Miner*, pt. iii, c. 11).

⁹ Convoc. Cornwall, 12 Chas. I, c. 4.

¹⁰ Ibid c. 3. Carew, *Surv. of Cornwall* (ed. 1811), 44.

¹¹ Houghton, *The Compleat Miner*, pt. i, art. 1.

¹² Ibid. pt. ii, art. 14.

¹³ *Cal. of Pat.* 1305, 331; 1308, 61.

¹⁴ *Cal. of Close*, 1319, 134; 1336, 579. *Cal. of Pat.* 1320, 537; 1328, 318.

¹⁵ Receiver's R. 29 Edw. III. Add. MS. 24746, fol. 120.

¹⁶ *Cal. of Close*, 1288, 499; 1319, 212; 1328, 478; 1333, 52; 1380, 527.

¹⁷ S.P. Dom. Jas. I, clii, 9.

¹⁸ *Cal. of Close*, 1319, 127.

¹⁹ S.P. Dom. Jas. I, Addenda, dxxi, 101.

²⁰ Add. MS. 6713, fol. 113. S.P. Dom. Eliz. cxii, 23; ccix, 22; ccxvi, 48; cclxii, 73. S.P. Dom. Jas. I, lxxviii, 36. Convoc. Cornw. 30 Eliz. c. 6.

²¹ Stat. 42 Geo. III, c. 72.

²² The Derbyshire lead fields were also divided into various administrative districts. (*Compleat Mineral Laws of Derbyshire*.)

²³ Pat. 47 Hen. III, m. 12; 27 Edw. I, m. 35; 15 Edw. IV, pt. i, m. 22; 1 Hen. VII, pt. ii, m. 25.

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its original nucleus. Five tracts of stanniferous wastrel, with their adjunct vales, supplied the ancient stream works of Cornwall. The moor between Launceston and Bodmin, in which the Fowey River has its source, gave rise to the northern stannary of Foweymore. Hensborough Beacon with the tin grounds of Roche, Luxulian, and St. Austell formed that of Blackmore. A smaller district on the north coast, including St. Agnes and Cligga, and extending inland to Truro, constituted the stannary of Tywarnhail. The stannaries of Penwith and Kerrier included two great tracts of waste, of which one lies north of Helston in Kerrier, and the other between Lelant and Land's End.

In each district was established a court, presided over by a steward, as the warden's representative. In Devon, where analogous divisions had taken place, already by 1243 we find the stannary courts recorded in the Pipe Rolls.¹ Cornwall, by the year 1297,² contained the stannaries of Blackmore, Penwith and Kerrier, and Tywarnhail, each with its court; but of Foweymore we have no trace until 1342.³

Gradually, also, arose a code, partly from prescription and partly no doubt from enactment by early stannary parliaments, the object of which was to make it dangerous for either tinner or foreigner to infringe the judicial liberties of the mines. It is unfortunate that we have not the records of the first stannary convocations, with which to trace the gradual steps by which the screw tightened. As it is, we must depend upon the law as defined by the convocations held from the sixteenth to the eighteenth centuries.⁴ No tinner, so it reads, might appear at an assize,⁵ or might sue, or allow himself to be sued, in any foreign court (any court outside the stannaries), save for pleas of life, limb, or land, under penalty of a heavy fine.⁶ No case determinable in the stannary court might be tried elsewhere, violations of this rule being punishable whether or no the offender were a tinner.⁷ Warrants and writs issued against the tanners from foreign courts were not allowed, and officers attempting to serve them were liable to arrest. In this category came

warrants issued by any justice of the peace,⁸ writs of cercionary from the royal courts,⁹ and writs of replevin from any one but the warden, and all attempts to remove suits from the stannary courts once they had there begun. Writs of prohibition, habeas corpus, and corpus cum causa, were allowed where the plea was one of land, life, or member,¹⁰ but no litigant might procure these writs under any other circumstances. The use of royal writs of subpoena to sue a tinner out of the stannaries for matters there determinable was equally forbidden, and the writ itself might be broken with impunity.¹¹ No appeals were permitted from stannary judgments to foreign courts, either by writs of error or of certiorari.¹² Save in the few cases where a tinner might legally be tried in a foreign court,¹³ in which event the jury was composed half of tanners,¹⁴ the latter were immune from jury service save in their own tribunals.¹⁵ A host of prosecutions recorded in mediæval stannary court rolls for violations of the above regulations not only confirm our views as to their antiquity, but prove conclusively that they were in no sense dead letters.¹⁶

From almost the first the stannary courts were obliged to contend for the maintenance of their prerogatives with the non-mining part of the population, partly by reason of conflicts of jurisdiction, and partly because of the miners' disregard in their operations for ordinary rights of property. Thus in 1309 we find the sheriff of Cornwall mobbed by the Blackmore tanners, on his attempting to levy upon their chattels.¹⁶ A few years later we see the tanners of Devon charged before the king with having intimidated the bailiffs of the hundred moots, and of having made arbitrary use of the stannary writ.¹⁷ Matters, however, did not come to a head until 1376, when two long petitions from the people of Cornwall and Devon were answered in the Good Parliament.¹⁸ But before examining their contents, a slight retrospect is essential for a clear view of the constitutional questions involved.

One reason for these disputes seems to have been the lack of precise definition with which

¹ Pipe R. 27 Hen. III, Devon.

² Exch. K. R. Bailiffs' Accts. of Edmund of Cornwall, 24-25 Edw. I.

³ Receiver's R. 26 Edw. III.

⁴ In the earliest existing court roll of the stannaries (P.R.O. Ct. R. bdle. 156, No. 26) we find instances of men charged with impleading tanners in a foreign court.

⁵ Add. MS. 6713, fol. 191.

⁶ Convoc. Cornw. 22 Jas. I, c. 7. Cf. *Compleat Mineral Laws of Derbyshire*, pt. i, art. 13, 18, 37; pt. 2, art. 40. Thomas Houghton, *The Compleat Miner*, 14, art. 31; pt. ii, art. 21. 'Certain Peculiarities in the Old Mining Laws of Mendip,' by C. Lemon, *Trans. Roy. Geol. Soc. Cornw.* vi, 330.

⁷ Pearce, *Laws and Customs of the Stannaries*, p. xx. A similar provision held in the Forest of Dean. Houghton, *The Compleat Miner*, pt. ii, art. 21.

⁸ Add. MS. 6713, fol. 112. Helston Court, 12 Hen. VIII.

⁹ Ibid. fols. 129, 130.

¹⁰ Convoc. Cornw. 12 Chas. I, c. 30.

¹¹ Add. MS. 6713, fol. 127 (Penwith and Kerrier Customs).

¹² Convoc. Cornw. 12 Chas. I, c. 30.

¹³ Chart. R. 33 Edw. I, m. 40.

¹⁴ Harl. MS. 6380, fol. 43.

¹⁵ P.R.O. Ct. R. bdle. 159, No. 1; bdle. 156, No. 26, etc.

¹⁶ Pat. 3 Edw. II, m. 43*d*.

¹⁷ Pat. 12 Edw. II, pt. i, m. 15, sched. Cf. also Close, 7 Edw. III, pt. i, m. 9*d*.; Pat. 8 Edw. II, pt. ii, m. 2*d*.; *Parl. R.* (Rec. Com.), i, 190, 297, 312, 382.

¹⁸ *Parl. R.* (Rec. Com.), ii, 343, 344.

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the charters had left the powers of the stannary courts. In practice stannary law covered five subjects; first, all rights and interests justly acquired under stannary law and custom, in the absolute usufruct of underground soil for the purpose of mining, and also a qualified usufruct of streams whose natural course might run within the surface limits of these rights, or whose use might be essential for mining operations, and, conversely, the prevention of injustice by the usurpations of such rights in violation of stannary law; secondly, the securing to the lords of the soil their due proportion of toll tin; thirdly, the regulation of all dealings between miners and blowers or smelters; fourthly, the enforcement of the assay and the coinage; fifthly, the power of adjudicating upon all matters in dispute between persons concerned in mining operations as regards tin, so as to entitle them to the character and privileges of tanners, or between such persons and any others not so concerned.

In these matters concerning tanners' rights two questions at once arose. The first concerned the definition of the word 'tanner.' Did it, as the stannaries claimed, include not only the manual labourers, but their employers, the holders of shares in mines, the dealers in tin and in ore, and all the artisan classes connected with tin mining? Or was it, as insisted on by their opponents,¹ to comprise only the working miners, and so long only as they remained at work?

The evidence is not a model of consistency. Our earliest, namely De Wrotham's letter of 1198,² says nothing, of course, with regard to a stannary court, but it includes among those classes whose customs are to be respected all diggers of tin, buyers of black tin, first smelters, and merchants of tin of the first smelting. The charter of 1201³ addresses its privileges to 'all tanners so long as they are at work.' The charter of 1305⁴ repeats this qualification, and then, apparently, adds another, confining its scope to the miners on the king's demesne lands. The ambiguities of phrasing with which this latter instrument abounds, and which were caught up by the stannary officials in support of their aggressive campaign against competing jurisdictions, gave rise to many complaints similar to those already cited, which in 1376 culminated in the two petitions introduced into Parliament by the people of Devon and Cornwall,⁵ which with their answers form a landmark in the constitutional history of the stannaries. It was protested, first, that the tanners, even off the

royal domains, claimed stannary privileges, and that not only labourers but their masters enjoyed the freedom of the mines; that the stannary courts were taking cognizance of pleas between tanner and foreigner arising elsewhere than in the former's place of work; that the warden allowed tanners imprisoned at Lostwithiel for felony to run at large; and that he seized into the stannary gaol villeins whom their masters were about to imprison for arrears of accounts, and treated them so well that they refused to return to their lords.

The exposition allowed on these points by Parliament and the king was in some details evasive, and in others clear. To the inquiry as to whether, in other than in the king's domains, the tanners were free, the king contented himself with pointing out that the charter of 1305 permitted the digging of tin in the lands of all parties. For other complaints, he appointed a commission of inquiry, whose findings, if ever made, were suppressed.⁶ He promised that pleas arising between tanners and foreigners and outside places where mining was actually carried on should not be taken to the stannary courts, and finally he defined the word 'tanner' to comprise only manual labourers in the tin works, and for so long only as they remained at work. This exposition, confirmed by Richard II a few years later,⁷ remained unchanged in principle for over a century.⁸

We may pass rapidly over the wording of the Charter of Pardon of Henry VII,⁹ the finding of his successor's commission in 1524,¹⁰ the deductions to be drawn from two of the latter's statutes,¹¹ the case of Boscawen against Chaplin,¹² the declarations of the stannary convocation in 1588,¹³ the three successive attempts made in 1608,¹⁴ 1627,¹⁵ and 1632¹⁶ to decide the question with the aid of the judges, the resolutions passed by the convocations of 1624¹⁷ and 1636,¹⁸ the attempt of the Long Parliament to settle matters, once and for all, by a reversion to the exposition made in 1376,¹⁹ and later promulgations on the same head by the stannary

⁶ Coke, *Institutes* (ed. 1644), bk. iv, 932.

⁷ Harl MS. 6380, fol. 99. Add. MS. 6713, fol. 196.

⁸ Cf. Stat. 16 Chas. I, c. 15, preamble.

⁹ Pat. 23 Hen. VII, pt. vii, m. 29-31.

¹⁰ Ratified by the Convocation of the Stannaries of Cornwall, 16 Hen. VIII, c. 1.

¹¹ Stat. 23 Hen. VIII, c. 8; 27 Hen. VIII, c. 23.

¹² Harl. MS. 6380, fol. 9.

¹³ Convoc. Cornw. 30 Eliz. c. 7, 8.

¹⁴ Close 6 Jas. I, p. 5.

¹⁵ Geo. Harrison, *Report on the Laws and Jurisdiction of the Stannaries*, App. K.

¹⁶ From a manuscript volume in the Duchy of Cornwall Office.

¹⁷ Convoc. Cornw. 22 Jas. I, c. 12.

¹⁸ Ibid. 12 Chas. I, c. 2, 5.

¹⁹ Stat. 16 Chas. I, c. 15.

¹ Cf. *Parl. R.* (Rec. Com.), ii, 343, 344.

² Black Book of Exch. No. 10.

³ Chart R. 36 Hen. III, m. 18.

⁴ Chart. R. 33 Edw. I, m. 40. In Devon the existence of the tax known as 'white rent,' levied upon the owners of white tin, whether miners or not, seems to show that the term 'tanner' was there interpreted broadly. (*Pipe R.* 20 Edw. I, Devon.)

⁵ *Parl. R.* (Rec. Com.), ii, 343, 344.

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parliaments of 1687¹ and 1752.² That so many efforts were made to adjust matters resulted from the close attention which the question of stannary jurisdiction had begun to attract from lawyers and jurists of all sorts. From the tinners' complaints to their warden³ it is evident that a more or less concerted movement was on foot to break down the stannary courts altogether, or, at least, to reduce them to a mere shadow of their power. Essentially a product of the reforming spirit of the Puritans, however, the movement lost headway and seems to have died out altogether with the Restoration.

Can we reconcile with one another these various interpretations? There is little doubt but that, granted at the outset a customary law of mining, exemption from all outside jurisdiction was purposely confined to tinners whose personal attendance was deemed essential for production. As for the others, whether their cases were decided on the manor, or in the shire and hundred courts, or whether by the royal justices, it is not for us to say. Doubtless, as time went on, they gradually, and quite illegally, came to use the stannary courts for law suits, and to plead before the warden and his officers to the exclusion of all other tribunals. When we say that, even in the thirteenth century, there probably existed many quasi-capitalist miners who conducted their operations through the medium of hired labour, to say nothing of dealers in ore and refined tin,⁴ when we admit the possibility of numerous technical questions arising between owners and adventurers and their hired help, which could not be settled save in the stannary courts where the latter were forced to plead, and add to this the aggressive spirit which, from the fourteenth century, as we know, characterized the stannary courts, the above supposition becomes highly probable.

To interpret the charter of 1305, one must bear in mind the fact that, addressed at the outset to all tinners, it includes, in the opening paragraph, certain grants of privileges to specifically mentioned bodies, namely, the tinners on the royal demesne lands, the king seemingly ignoring the charter of 1201 and its later confirmation, and granting freedom from pleas of serfdom to working miners on his own estates, with the additional privilege of being liable for actions arising in the stannary, and not involving land, life, or limb, solely before the warden and his officers. The remainder of the charter is addressed to all tinners, and confirms the ancient rights of bounding, with its concomitant

privileges of wood and water; and grants them (including for the first time those not actually engaged in manual labour) the right of pleading in the stannary courts. These were given cognizance, on the civil side, of all pleas between tinners, and between tinners and foreigners, provided the case arose within the stannaries, with the proviso that, in any suit in which a tinner was involved, if he wished to put it to an inquest of the country, half the jury must consist of tinners. Criminal cases, where the accused was a tinner, were dealt with in the ordinary courts, with the concession to the stannaries that tinners were to be lodged in a special gaol.

The exposition given in 1376 referred merely to the franchises granted for the first time by this charter, and left untouched the ancient customary rights which antedated all written documents. What we have to note with regard to the word 'tinner' is the fact that it dealt merely with the special privileges granted to tinners on the royal estates. In their case it was defined as including only manual workers so long as they worked. Upon the more important question as to the comprehensiveness of the word, applied to the great mass of tinners outside the royal domains, no complaint appeared and no definition was attempted.

After a lapse of one hundred and thirty-one years we arrive at the Charter of Pardon granted by Henry VII.⁵ The specific persons to whom this applied were bounders, owners of tin works and smelting houses, and buyers of ore and tin, men of conditions of life far above that of the labouring tinner. They had offended against certain ordinances made by Prince Arthur for the direction of the stannaries.⁶ Now these ordinances could not be applicable to, or bind any others than those who came within the operation of the customs, and consequently within the jurisdiction of the stannaries, and therefore all these offenders could only have incurred the penalties from which they were to be relieved, in the character of tinners, in the most extensive construction of the term, embracing all persons having an interest or concern in any mining operations regarding tin.

The commission of inquiry in the sixteenth year of Henry VIII adopted the term 'tinner' in this sense, as embracing 'such as have portion of tin works, or that employ some charge on the sinking, working, or in the making things necessary for the getting of tin.' The same interpretation is to be found by a close examination of the two Acts of Parliament above cited,⁷ and in the cases of Boscawen against Chaplin,⁸ and Trewynnard against Killigrew.⁹

¹ Convoc. Cornw. 2 Jas. II, c. 1-4, 8, 23.

² Ibid. 27 Geo. II, c. 1-4, 8-10, 14, 17.

³ On this question see Pearce, *Laws and Customs of the Stannaries*, 147, 149-151. S.P. Dom. Eliz. ccxxvii, 8; Jas. I, lxxviii, 36. Add. MS. 24746, fol. 92. Manuscript volume in Duchy of Cornwall Office, fol. 337.

⁴ Black Book of Exch. No. 10.

⁵ Pat. 23 Hen. VII, pt. vii, m. 29-31.

⁶ Add. MS. 6713, fol. 101-104.

⁷ Stat. 23 Hen. VIII, c. 3; 27 Hen. VIII, c. 23.

⁸ Harl. MS. 6380, fol. 9.

⁹ Harrison, *Report on the Laws and Jurisdiction of the Stannaries*, 55.

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In following definitions of the word 'tinner,' we meet with a novel and arbitrary mode of interpretation. The old distinction between tinners on the royal estates and those elsewhere had probably long been dropped, and in its stead arose a theory which attempted to apply to all tinners that contrast between working and non-working tinners brought out in 1376,¹ the main point being the claim that only working tinners might be excluded from all but stannary courts, while others possessed rights of suit at stannary or common-law courts at their choice. Granted this proposition (and it seems to have found acceptance from the first), the question remained as to what tinners belonged to the privileged class, and which were merely 'tinners at large.' The judges, in 1608, decided that the former comprised blowers and all other labourers while at work. The stannary convocation in 1624 seems to have extended the privilege of not being suable in other than the stannary courts, to another sort, namely, to owners of blowing-houses and adventurers who were at any charge for getting or making tin. It was probably this extension of privilege which occasioned the second reference to the judges three years later. Their explanatory decision amounted to little more than a reversion to the rule of 1608, and the same statement may be made with regard to the rules laid down by the king in council in 1632, and the statute of 1641. An inspection of succeeding codes of stannary law in the reigns of James II and George II makes it clear that their provisions are built upon this principle, and an uninterrupted course of usage and practice in conformity with it carried the doctrine down to 1837.

The second great question concerned itself with the local limits for the exercise of the stannary jurisdiction. None seem to have been prescribed until the charter of 1305, in which, as regards miners on the royal estates, exemption was granted from pleading elsewhere than before the stannary courts for all pleas arising *ultra predictas stannarias*, i.e. which were on the demesne lands. Other miners were answerable to the stannary court for pleas arising among themselves, and between themselves and outsiders, concerning all trespasses, plaints, and contracts made in places where they worked within the stannaries arising. In answer to the petitions of 1376, the above was interpreted to mean that the jurisdiction extended to places where the workmen were at work and nowhere else, a decision which, if acquiesced in by the tinners, would have resulted in unending confusion. The charter of 1305 itself, in its clause of pre-emption, calls for the coinage of the tin in Lostwithiel, Bodmin, Liskeard, Truro, and Helston. All contracts made there for the sale

and purchase of tin were unquestionably determinable in the stannary courts, of which we have had an instance in the case of Boscawen against Chaplin, where the cause of action arose upon a contract made at Truro between persons who were not labourers, which, nevertheless, was decided by a stannary court.

The judge before whom the question was raised in 1608 decided that transitory actions between tinner and tinner, and worker and worker, might be decided in the stannary courts, even if the cause arose outside the stannaries, or at common law, at the election of the plaintiff. But if in such a case only one of the parties were a tinner, the defendant might have the case removed to a foreign court. They further ruled that the courts of the stannaries had no jurisdiction over local cases arising outside the stannaries, and that the privileges of workmen did not extend to any local case arising outside the stannaries whereby any freehold should be demanded, 'for that matters of life, member and plea of land were exempted by the express words of the charter.' The stannary convocation in 1624 recognized stannary jurisdiction as embracing the contracts or dealings of all persons whomsoever in the buying or selling of uncoined tin, without limitation or qualification as to their condition and without reference to the place where they might be entered.² By the resolutions of the judges in 1627 it was decided, with reference to the extent of the stannaries, that they comprised every village, hamlet, or tithing wherein tin works existed, or should be wrought, during such time only as active mining operations should be carried on.

A further step was taken by the Privy Council in 1632, when they decided that, since in practice all Cornwall had been treated by the stannary courts as within their jurisdiction, and as the other provisions of the mining charters applied to the entire county, matters had best continue *in statu quo*. In the twenty-first section of the laws of the parliament of the Cornish stannaries of 1636, the stannary jurisdiction is recognized as embracing all dealings in black tin, and gives a remedy to the party wronged without qualification as to the condition of the two parties, or reference to the place of dealing. The statute passed by Parliament in 1641 returned to the exposition of 1376, 'that the words *in locis ubi operantur*, be expounded of the village, hamlet, and tithing where some tin work is situated, and not elsewhere, and no longer than the same tin work is, or shall be working.' Its operation, however, was deemed, in practice, to be confined to the case of labouring tinners, and this construction was adopted in the laws of 1687 and 1752, and has so continued until recent times.

It has been seen that, from a legal standpoint, the stannaries were a peculiar jurisdiction, under the operation of certain laws, customary and

¹ Expediency, of course, was the sole excuse for this interpretation.

² Convoc. Cornw. 22 Jas. I, c. 5.

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statutory, technical and non-technical, for the administration of which a royal officer, the warden, was responsible. The head of the stannary system was, accordingly, the king, or, after 1337, the Prince of Wales, as Duke of Cornwall. Beneath him stood the warden, then the vice-warden, and lastly, the lower stannary courts with their stewards and juries of miners.

The warden, however, as far back as we find records, invariably delegated his judicial and magisterial powers to his lieutenant and to the stewards, and interfered in legal questions only in appeals from the vice-warden's verdicts.¹ The latter's powers were, first of all, magisterial, for the prevention, by summary process, of offences against stannary laws, and for their summary punishment, if perpetrated.² Next, as judge of the vice-warden's court, he had original jurisdiction in matters of equity. The origin of this power will always remain obscure, as it is impossible to find warrant for it in any reasonable interpretation of the charters of 1201 and 1305, which contain no legal phrase not to be found in common-law writs.³ On the other hand, the early petitions addressed to the Prince of Wales⁴ are rarely made to the warden, but to the prince's proper officer whoever he might be; neither were they restricted to the subject of mining.⁵ Gradually, without doubt, from these petitions and the orders from the prince's council arose an equitable jurisdiction. Similar petitions to great lords and their councils ripened into courts of chancery, notably the case of the courts of the president and council of Wales,⁶ and probably only the interposition of parliament prevented the growth of many courts of local equity.⁷ The prince's council survived those of other subjects,⁸ and in the case of the Duchy of Cornwall, long usage, the fact that many of the petitions related to the stannaries, and the union of the wardenship with the other high offices of the duchy⁹ for centuries, co-operated to narrow the prince's jurisdiction to the same subjects as those embraced by the tinnerns' charters.

As no records were kept of the proceedings of the vice-warden's court till 1752,¹⁰ one cannot

say how early it had actual practice in equity. Carew, in 1602, wrote of the warden that 'he supplieth the place, both of a judge for law, and of a chancellor for conscience, and so taketh hearing of causes either *in forma juris* or *de jure et equo*. He substituteth some gentleman in the shire, of good calling and discretion, to be his vice-warden.'¹¹ In a dissertation a few years later, we find words to the same effect,¹² and the vice-warden's power in equity was, in 1608,¹³ declared by Coke to be founded on prescription. The express recognition of these powers in later years, and their unopposed exercise, leave no doubt as to their validity in theory and in practice.¹⁴

The vice-warden's appellate jurisdiction dates certainly back to 1510,¹⁵ and probably earlier. In that year we see that the course of appeals in the stannary courts lay from steward to vice-warden, from vice-warden to warden, and from warden to the prince's council, and in 1565 this measure was confirmed in the case of Trewynnard against Roskarrock,¹⁶ as well as affirmed repeatedly in stannary records of later years. More recently, however, arose a practice, quite unwarranted, of using the vice-warden's court as one of original common-law jurisdiction. This seems to have been exercised chiefly in cases of debts due to merchants and tradesmen for the supply of materials or goods requisite for the working of the mines, and to tinnerns for their labour. The delays in the stewards' courts had proved vexatious beyond measure,¹⁷ and the fact that, normally, the case was certain to come eventually before the vice-warden now caused it to be carried to him direct.

This practice seems also to have been due to the system of adventuring, which in the eighteenth and nineteenth centuries was at its height in Cornwall. The creditors who supplied the mines were made to look for payment to the purser of the company,¹⁸ and as he received all moneys arising from the produce of the mines they could usually reach him by petition to the vice-warden,¹⁹ while the purser, in turn, had

and chief steward,' the 'understeward,' and a jury of twenty-four, half tinnerns and half merchants. Cf. also *Acts of P. C.* 1593, 266, 342.

¹¹ Carew, *Surv. of Cornw.* (ed. 1811), p. 58.

¹² Harrison, *Report on the Laws and Jurisdiction of the Stannaries*, App. I.

¹³ Close, 6 Jas. I, pt. v.

¹⁴ Convoc. Cornw. 22 Jas. I, c. 21; 12 Chas. I, c. 18; 27 Geo. II, c. 9, 11; Add. MS. 6682, fol. 507.

¹⁵ Add. MS. 6713, fol. 190, 191.

¹⁶ Coke, *Institutes* (ed. 1661), bk. iv, p. 233. The same plaintiff had also met similar defeat in 1562 on presenting his bill of complaint in the Court of the Queen's Bench.

¹⁷ Harrison, *Report on the Laws and Jurisdiction of the Stannaries*, App. M.

¹⁸ Convoc. Cornw. 2 Jas. II, c. 6.

¹⁹ Ibid. 27 Geo. II, c. 11.

¹ The warden was the general representative of the stannaries as against the government of England, mustered the tinnerns in times of war, and acted as their spokesman with regard to stannary affairs.

² Convoc. Cornw. 22 Jas. I, c. 6, 12, 13.

³ Smirke, *Vice v. Thomas*, App. 102.

⁴ White Book of Cornwall, 23 Nov. 34 Edw. III, cited by E. Smirke, *Vice v. Thomas*, App. 26.

⁵ White Book of Cornwall, i, c. 15.

⁶ Coke, *Institutes* (ed. 1661), bk. iv, p. 242-245.

⁷ Stat. 15 Ric. II, c. 12; 16 Ric. II, c. 2.

⁸ It was recognized by parliament (*Parl. R.* ii, 371).

⁹ Close, 8 Edw. II, m. 7.

¹⁰ Convoc. Cornw. 27 Geo. II, c. 16. The case of *Boscawen v. Chaplin*, in the reign of Henry VIII, seems to have been dealt with as a special case, as it appears to have been tried before the 'underwarden

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power to recover against his fellow-adventurers. If on investigation a question should arise as to the sum due to the petitioning creditor, the vice-warden, on request of either party, would direct an issue to the stannary court to try that point by a jury. The law of 1752, which established this procedure, was silent as to the mode the creditor was to pursue for recovery, and it would seem to have a twofold aspect as to jurisdiction, with reference to the different objects it embraced. The first paragraph of the Act was confined to a transaction altogether of legal character, namely, a contract between an adventurer in a mine (the purser), exclusively of his co-adventurers, and a merchant, for the supply of material, or a working tinner for the sale of his labour. The other aspect is shown in the following paragraphs which related to the settlement of the purser's claims upon his partners, and this, as a matter of equity, should have been settled by the vice-warden. The course of procedure, therefore, would have been consistent throughout. The creditor would proceed against the purser at common law in the court of the steward, and the purser would have his remedy against his partners, in equity, in the court of the vice-warden.

The effects of the unlawful practice of suing for debts directly to the vice-warden was to diminish the activities of the lower courts by withdrawing from them nearly all their proper business, since, with regard to simple contracts having no connexion with mining, recourse, by this time, was usually had to the common law.¹ Matters thus continuing for a considerable period, the above exercised jurisdiction of the vice-warden was suddenly called in question and denied by two successive law-suits.² As a result, both vice-warden and stewards declined to hold courts until their respective jurisdictions could be settled, and confusion continued until the passage of the Stannaries Act of 1837.

The stewards' courts, of which there were four, had been the place of usual resort for stannary cases. The stewards, who seem to have been appointees of the warden,³ began to exercise their authority at least as early as 1243.⁴ Like the vice-warden, they were invested with powers of magistrates within their respective stannaries,⁵ and their jurisdiction in ordinary court matters has already been discussed. In general, it may be remarked that their courts were to that of the vice-warden as the common-law courts are to those of chancery. In addition to the exercise of his magisterial and ordinary judicial powers, it

¹ The statute 16 Chas. I, c. 15, gives leave for tinnors to sue one another outside the stannary courts.

² See Hall v. Vivian, printed in Smirke, *Vice v. Thomas*, 37.

³ E. Smirke, *Vice v. Thomas*, App. p. 97.

⁴ Pipe R. 27 Hen. III.

⁵ Convoc. Cornw. 12 Chas. I, c. 12.

was the steward's duty to hold special sessions at the request of litigants, when necessary, for the trial of rights in tin works,⁶ and to hold 'customary' courts which, according to ancient custom, 'were always held the morrow after certain fairs within each stannary for the benefit of such as do attend the fair and court.'⁷

If we omit from consideration the two last⁸ we shall find the legal business of the lower courts transacted in thirteen sessions,⁹ held each year in each of the four districts, of which two, one in the spring and one in the fall, were courts leet. In all, however, the cases, criminal and civil, were decided by a jury of tinnors (usually four in number),¹⁰ a procedure at least as old as 1305,¹¹ and probably older. The pleas consisted of all manner of personal actions, many of them relating to trespasses, for taking tin and for entering *opera stannaria*, or tin works.¹² In 1495, when the practice of entering bounds in the court rolls seems first to have been established,¹³ we find them described as *opus stanni* or *opera stannaria*, and there seems little doubt, therefore, that the court exercised the power of adjudicating upon this species of property. There were also, to a late date, numerous entries of hue and cry raised in respect to trespasses levied upon tinnors, and presentments of bailiffs of unjust raisings of hue and cry were a common cause of amercement.¹⁴ Cases of debt and contract, assault and battery,¹⁵ offences peculiar to mining law, such as the diverting of a mine's watercourses, formed a large proportion of the legal business transacted. Another class of cases shows how completely the tinnors were separated from the ordinary courts; for example, the encroaching upon a neighbour's cornfield with one's swine and geese,¹⁶ infractions of the Assize of Beer,⁸ or, shortly after the Black Death, evasions of the Statute of Labourers.¹⁷

A phenomenon illustrating the connexion of the steward's court with the hundred and shire

⁶ Convoc. Cornw. 16 Hen. VIII, c. 30.

⁷ Convoc. Cornw. 22 Jas. I, c. 18, 27; 12 Chas. I, c. 22.

⁸ Of customary courts not a record remains. Special courts are entered under that name, although it is probable that the inquisitions and findings of juries respecting trespasses in such works (of which entries are frequent) may be referable to adjourned courts so held upon the works themselves.

⁹ A tri-weekly barmote court was held in the Derbyshire mines by the barmaster and a miners' jury (*Compleat Mineral Laws of Derbyshire*, pt. iv, art. 2; pt. i, art. 16).

¹⁰ Convoc. Cornw. 16 Hen. VIII, c. 3. Harrison, *Report on the Laws and Jurisdiction of the Stannaries*, p. 170.

¹¹ Chart. R. 33 Edw. I, m. 40.

¹² P. R. O. Ct. R. bdle. 156, No. 27.

¹³ E. Smirke, *Vice v. Thomas*, App. 101.

¹⁴ P. R. O. Ct. R. bdle. 168, No. 5.

¹⁵ Ibid. bdle. 156, No. 27.

¹⁶ Ibid. bdle. 159, No. 1.

¹⁷ Ibid. bdle. 161, No. 81.

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courts is the part played by the village tithingmen as assistants to the court bailiffs in presentment of criminals,¹ while as regards civil suits, the stannary laws inform us that in cases which involved a bailiff the returns were made by the tithingman of the place where the venire arose,² and the same procedure held good when the bailiff was challenged in a civil suit on grounds of favouritism.³ Presentments were made also by the toller, who seems to have served as connecting link between the stannaries and the manor. We have seen in him the servant of the lord who received from the tinnners their toll. Next we find him, no doubt in his master's interests, intervening in the bailiff's absence to arrest ore in dispute,⁴ and to commit it to custody until the contention was settled. From that it was but a step for him to be empowered to make returns for civil suits when neither bailiff nor tithingman was able to act,⁵ while repeated instances also can be found of presentments of offenders by the toller of this or of that place, in the same nature as those brought by the tithingman and bailiff.⁶

The two leet courts with view of frankpledge⁷ contained several novel features. In the stannary of Blackmore, as far back as the earliest extant court rolls,⁸ eight tithingmen in the hundred of Powder appeared with their tithings to do suit and to present criminals, acting in the latter capacity as *ex officio* bailiffs.⁹ Another feature was the presentment of stannary offenders by a grand jury of twenty-four¹⁰ tinnners, composed in later centuries at least of the more substantial of the brotherhood.¹⁰

The leet's functions did not cease with the ordinary business of a law court. Attended, theoretically at least, by every tinner of the district,¹¹ it resembled in many ways the manorial halimote, or the court of a trade guild, inasmuch

as it seems to have been the common meeting place of the miners, and the administrative centre of the stannary district. There the tinnners chose such officers as they had within their power to elect. What the manner of procedure had been in earlier times it is hard to say, but by the seventeenth century the power of choice had become vested in the grand jury. Thus, from the records of the Cornish mine parliament of 1636, it appears that they designated, at the first law court after Michaelmas, a receiver for the stannary common funds, while, at the same time and place, the receiver for the time being accounted for his charge and turned it over to his successor.¹² There a jury of twelve decided on measures to be used against tinnners who refused to pay their stannary assessments,¹³ while the grand jury nominated a few petty officers of a quasi-manorial character, such as supervisors of roads and port-reeves.¹⁴

The leet served also to register the initiation oaths of stannary officials. In open court appeared the head bailiff, the weigher, and the assay master and his deputies, who weighed and tested the tin at the coinage, and in the presence of the jury took oath to fill their office justly.¹⁵ The owners of blowing-houses appeared and registered their house-marks in the steward's book, and presented their men to take an oath of honest service.¹⁶ At the Michaelmas session came the verification of the gallon and foot-fate measures used in the dividing of the ore, which former duty was performed by the head bailiff with a few tinnners empanelled for that occasion.¹⁷ Proclamation was made by the stewards of royal ordinances or of statutes which dealt with the stannaries,¹⁸ and presentments were occasionally made by the grand jury of the more important customs used in that district.¹⁹

Few phases of stannary history are more obscure than the tinnners' parliaments or convocations. The presence of similar bodies in the Forest of Dean,²⁰ the possible analogy of ancient tribal assemblies among the British, and the exasperating way in which all documentary evidence before the reign of Henry VIII has disappeared, tempt one to speculate as to the origin of these bodies instead of proving it. In both

¹ P. R. O. Ct. R. bdle. 156, No. 27.

² Convoc. Cornw. 12 Chas. I, c. 28.

³ Add. MS. 6713, fol. 279. Presentment of the jury of Penwith and Kerrier, 1636.

⁴ Harl. MS. 6380, fol. 39.

⁵ Add. MS. 6713, fol. 246.

⁶ P. R. O. Ct. R. bdle. 161, No. 81.

⁷ Add. MS. 24746, fol. 122. The leet courts in Dean were known as the Mine Law Courts, and were held by the constable of the Castle of St. Briavel's (Houghton, *The Compleat Miner*, pt. ii, art. 20). In Derby they were known as the Great Barmote Courts (*Compleat Mineral Laws of Derbyshire*, pt. ii, art. 18, 25).

⁸ 1355.

⁹ Harl. MS. 6380, fol. 3. P. R. O. Ct. R. bdle. 157, No. 13.

¹⁰ Convoc. Cornw. 30 Eliz. c. 26. Add. MS. 6713, fol. 259. Note also that a special jury of four 'of the best sort of tinnners' was returned by the grand jury, to assess amerciements (Convoc. Cornw. 30 Eliz. c. 27).

¹¹ 'The Ancient Stannary of Ashburton,' by R. N. Worth, *Trans. Devon Assoc.* viii, 321. Fines for non-attendance appear in various court rolls. Cf. P. R. O. Ct. R. bdle. 152, No. 21; bdle. 159, No. 16.

¹² Convoc. Cornw. 12 Chas. I, c. 36.

¹³ Ibid. 30 Eliz. c. 27.

¹⁴ P. R. O. Ct. R. bdle. 156, No. 21, Convoc. Cornw. 22 Jas. I, c. 32.

¹⁵ Convoc. Cornw. 12 Chas. I, c. 12.

¹⁶ Convoc. Cornw. 16 Hen. VIII, c. 17. P. R. O. Ct. R. bdle. 156, No. 21.

¹⁷ Convoc. Cornw. 12 Chas. I, c. 20.

¹⁸ Pearce, *Laws and Customs of the Stannaries*, 154. The stannaries were, of course, at the mercy of an Act of Parliament. Cf. Stat. 16 Chas. I, c. 15; 4 Hen. VIII, c. 8, dealing with Strode's case.

¹⁹ Add. MSS. 24746, fol. 122; 6713, fol. 279.

²⁰ Nicholls, *The Forest of Dean*, 45, 47, 49, 54, chap. iv.

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counties the parliaments were probably an expansion of and an offshoot from the grand juries in the stannary courts, which, as we have seen, were called upon to declare the customs, and which often prefixed to their presentments of criminals a confirmation of existing stannary law.¹

It is stated in the older local histories that until 1305 the tanners of Devon and Cornwall met in one parliament, on Hingston Hill, near Callington,² and that after the charters of that year the two counties held their parliaments apart.³ All that can be stated, however, is that the records of the Devon parliaments go back only to 1510,⁴ while those for Cornwall begin with 1588,⁵ by which latter date the convocations were assembled in accordance with the articles of the Charter of Pardon. This document was the indirect result of the cupidity of Henry VII, who, in consequence of violations of the stannary laws on the part of the tanners, especially of the regulations initiated by Prince Arthur,⁶ had declared the stannary charters forfeited, and restored them in 1507 only upon payment of a fine of £1,100. To the original document he added a grant of new powers to the Cornish parliament. 'Twenty-four 'stannators' were to be nominated, six by the mayor and council of each of the towns of Lostwithiel, Truro, Launceston, and Helston, representing the stannaries of Blackmore, Tywarnhail, Foweymore, and Penwith and Kerrier, and the convocation so constituted had power to allow or disallow any statute or proclamation made by the king, or by the Prince of Wales, which should be 'to the prejudice of any tinner, or other person having to do with black or with white tin.'⁷ Under these auspices began the parliaments whose records can still be traced.⁸

The question as to whether they represented all classes of tanners requires to be answered with some circumspection. Although in Devonshire the manner of election was highly democratic,⁹ in Cornwall the case was different, due to the fact that the nomination of stannators was

the privilege of the mayors and councils of the stannary towns. How they exercised their powers for the first century and a half we do not know, but in 1687, in consequence of the failure of the convocation to ratify a royal contract for the preemption, we find the warden suggesting to the king the possibility of so returning members 'that they will consist of loyal, sober persons,'¹⁰ and ten years later complaint was made that the mayors of the stannary towns who returned convokers were the bitterest enemies the tanners had.¹¹

Even where appointments were free from bias, it is doubtful if the Cornish parliaments represented any class but that of the large mine-owners or tin dealers, inasmuch as a perusal of the lists of members reveals few who were neither knights, baronets, gentlemen, nor esquires.¹² Further evidence to the same effect is supplied by the origin of the body known as 'the assistants.' As early as Elizabeth's reign the stannators had petitioned the queen that their numbers be doubled, and that the additional members from each stannary be chosen by the stannary courts as in Devon.¹³ The request was not granted, but by 1674 we find the stannators each nominating an assistant, and the latter summoned by the vice-warden to consult with the convocation, the idea being that by this means the latter would be kept better informed of the situation among tanners of the lower ranks.¹⁴ It is questionable whether this was the effect. The assistants as well as their principals appear to have been gentlemen,¹⁵ and, whatever their station, their sole function seems to have been to say yes or no to propositions submitted for their approval. They were allowed no votes, they were not even present at the sessions, but were placed in a separate apartment, and called in only on rare occasions; nor does it appear that they ever ventured to dissent from any bill upon which their opinion was sought.

As to the actual power which these parliaments could exert in the face of royal or of princely opposition, the meagreness of the records does not permit of a satisfactory answer. So far as they go they reveal two or three instances in which the royal will was thwarted. Thus in the reign of Charles II we find the appointment of Penzance as a coinage town nullified for some time, by the neglect of the convocation of tanners to extend to it the ordinary laws of the coinage.¹⁶ In 1674, again, the parliament was at

¹ The lead mines of Derbyshire and of Mendip do not seem to have held parliaments, but the great Barmote Courts of the former really performed the functions of a parliament, together with those of a court (*Compleat Mineral Laws of Derbyshire*). The Devon parliaments were spoken of as 'Great Courts,' and the members as jurates.

² Carew, *Survey of Cornwall* (ed. 1811), p. 17.

³ Add. MS. 6682, fol. 507.

⁴ *Laws of the Stannary of Devon* (ed. 1575).

⁵ Add. MS. 6713, fol. 195, et seq.

⁶ Ibid. fols. 101-104.

⁷ Pat. 23 Hen. VII, pt. vii, m. 29, 30, 31.

⁸ The order of procedure observed differed little from that of the House of Commons. See Add. MS. 6713, fols. 415, 456.

⁹ 'The Ancient Stannary of Ashburton,' by R. N. Worth, *Trans. Devon Assoc.* viii, 321.

¹⁰ Treas. Papers, ii, 10.

¹¹ *The Tanners' Grievance*.

¹² Add. MS. 6713, fols. 194, 223, 353, 415, 456. Treas. Papers, ii, 58. See also *Hist. MSS. Com. Rep.* ix, pt. ii, 90-94.

¹³ Convoc. Cornw. 30 Eliz. c. 5.

¹⁴ The practice is referred to as having been in use previous to 1674 (Add. MS. 6713, fol. 392).

¹⁵ See Add. MS. 6713, fol. 393 et seq., 459.

¹⁶ T. Pearce, *Laws and Customs of the Stannaries*, 103.

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loggerheads with the king, on account of its refusal to delegate its contracting powers to a select committee who were to be summoned to Whitehall and overawed into signing a contract for the preemption.¹ On the whole, however, the relations with the crown seem to have been friendly enough. There would, in any case, be little cause for friction, the main flurries between the stannaries and royalty being conflicts of courts, while the proclamations and statutes which the parliaments were called upon to disallow seem seldom to have been numerous or unreasonable. As time advanced, the occasions for the calling of parliaments grew less and less frequent, and for the last one, that of Devon, in 1822, our sole information is that the members, having been sworn in at Crockerntorre, adjourned to a neighbouring town.²

The exemption of tinners from ordinary taxation seems, excepting the case of ship money in the year of the Armada,³ to have been recognised as absolute.⁴ Occasionally the privilege was attacked and attempts were made by royal officers to tax the tinners illegally,⁵ but these were usually repudiated by the crown and the liberties upheld. Such an instance took place in 1338, when a levy of the tenth and fifteenth was answered by the miners refusing to operate their works until their grievance had been redressed.⁶ Legal protection from collectors was also sought by the tinners in their courts, and the bailiff, customer, or sheriff, who included tinners in his lists, came under the operation of the penal statutes of the stannaries.⁶

The tinners, however, were subject to assessments of their own. Of some of the older impositions we have already had occasion to speak. Even at that period, when the production of tin was low, we find the king's mark for both stannary counties totalling £600 in 1199,⁷ £668 in 1212,⁸ and £799 in 1214,⁹ amounting to more than the combined revenues from Cornwall and Devon.¹⁰ It was this importance of tin as a source of royal income which guaranteed the

tinners the continuity of royal support, and emboldened them in their stand against manor and shire.¹¹

With the development of stannary taxation during the thirteenth century, and the establishment of a hierarchy of collectors, on the lines which De Wrotham had laid down in 1198, we need not concern ourselves. Those curious to learn of the different expedients to which Richard of Cornwall and his son Edmund resorted, to raise money, can find enlightenment in the sources,¹² but most interest is centred upon the devices by which revenue was raised from the Cornish stannaries from the fourteenth century onward.

There were, in the first place, sums accruing from various miscellaneous perquisites. The duke had his share in the profits of the stewards' courts, the amounts in no case being over £20 from any one district, and usually much less.¹³ Dublet, a small tax in Penwith and Kerrier, brought in 11s. 8d. per annum,¹⁴ while the 'fine of tin,' collected in Blackmore stannary, and in Pyder hundred, contributed usually a lump sum of 65s. 8d.¹⁵ Occasionally receipts are found from the sale of tin forfeited because sold unstamped, or fraudulently marked.¹⁶ In like category we may mention a profuse coinage of tin half-pennies and farthings undertaken by James II, and by William and Mary, for the purpose of profiting by the high seigniorage;¹⁷ the smelting-houses which the Black Prince ran at Lostwithiel;¹⁸ and the small sums which Edward IV

¹¹ The chief forms assumed by the taxation in the Derbyshire mines were 'lott' and 'cope,' the former the thirteenth dish of ore as toll to the lord of the soil (in most of the mines the king), and the latter 6d. per load of nine dishes (*Compleat Mineral Laws of Derbyshire*, pt. i, art. 12, 13, 20). 'Lott lead' in Mendip was the tenth pound blown at the hearth. ('Peculiarities in the Old Mining Laws of Mendip,' by C. Lemon, *Trans. Roy. Geol. Soc. Cornw.* vi, 329.) In Dean, the miners of 'beneath the wood' supplied each week twelve charges of ore to the king's forges at 1d. per charge (Houghton, *The Compleat Miner*, pt. ii, art. 19). Every miner, besides, paid a royal tax of 1d. per week (Houghton, *The Compleat Miner*, pt. ii, art. 15).

¹² Exch. K. R. Bailiffs' Accts. of Edmund of Cornwall, 24-25 Edw. I; Pipe R. 20, 23, 27, and 34 Edw. I, Devon; Aug. Off. Duchy of Cornw. Accts. part 5.

¹³ In 1450 only £3 all told (Receiver's Roll, 29 Hen. VI).

¹⁴ It appears first in 1302 (Pipe R. 30 Edw. I, Cornw.), and vanishes after 1507 (Ministers' Accts. Duchy of Cornw. 22 Hen. VII).

¹⁵ See Ministers' Accts. Duchy of Cornw. 16 Edw. III.

¹⁶ Receiver's Roll, 21-22 Eliz.; 4 Jas. I.

¹⁷ *Cal. S. P. Dom.* 1651, 313-315; S. P. Dom. Chas. II, xxxvii, 19; ccxxx, 75; Treas. Papers, lxxxvi, 102; vii, 73; lxxxiv, 138. Collins, *A Plea for the Bringing in of Irish Cattle*.

¹⁸ White Book of Cornwall, 32 Edw. III, c. 89.

¹ Add. MS. 6713, fol. 387.

² De la Beche, *Geology of Cornwall, Devon, and West Somerset*, 586.

³ *Acts of P. C.* 1588, 198; S. P. Dom. Eliz. ccxii, 53; ccxvi, 48; cclxii, 73.

⁴ Pat. 12 Edw. III, pt. 1, m. 23d; 1 Edw. IV, pt. iii, m. 13; Close, Edw. III, pt. ii, m. 20; 12 Edw. III, pt. iii, m. 13; Add. MS. 24746, fol. 92; Convoc. Cornwall. 16 Hen. VIII, c. 10.

⁵ Close, 12 Edw. III, pt. iii, m. 13.

⁶ Add. MS. 6713, fol. 253. This exemption from ordinary taxation gave rise to continual frauds on the part of men who wished to become tinners merely to escape payment of rates. P. R. O. Lay Subs. R. bdle. 95, Nos. 12, 22; Pat. 12 Edw. III, pt. i, m. 23d; 16 Edw. III, pt. iii, m. 2d; 17 Edw. III, pt. i, m. 40d, pt. ii, m. 5d, 32d; Close, 11 Edw. III, pt. ii, m. 20.

⁷ Pipe R. 1 John.

⁸ Ibid. 14 John.

⁹ Ibid. 16 John.

¹⁰ About £500 per annum at this date.

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realized from his shares in several of the mines themselves,¹ while, from such of the mines as were on the duchy manors, the duke drew toll tin at the local rates.² Tribulage, a poll tax levied in Blackmore at the rate of $\frac{1}{2}d.$, and in Penwith and Kerrier at $\frac{1}{2}d.$,³ and after the Black Death at $2d.$,⁴ for each labouring tinner, in the best of times amounted to but a few pounds⁵ each year.

Many of the above were frequently farmed to collectors for round sums, and this fact becomes especially prominent in the case of the preemption.⁶ Its origin cannot be traced back further than 1195, when Richard I made a considerable profit in tin trades.⁷ It seems also to have been exercised by John,⁸ and Edmund of Cornwall made use of it in 1297,⁹ and possibly at other times.¹⁰ The right of preemption was embodied in the charter of 1305,¹¹ and during the fourteenth century was exercised on half a dozen different occasions, although in some cases the opposition of the tinner was so great as to compel its withdrawal. Edward II used it in 1312,¹² and, later, made it over to Antonio of Pisa, an Italian merchant to whom he was in debt.¹³ His exactions,¹⁴ and the tinner's opposition,¹⁵ resulted in the speedy withdrawal of the patent,¹⁶ and the same result followed an attempt, a few years later, to farm the preemption to two of the king's servants.¹⁷ An effort on the part of Edward III, in 1338,¹⁸ met with a similar fate, but the Black Prince not only exercised the prerogative for his own direct benefit,¹⁹ but leased it to a German merchant.²⁰

¹ P. R. O. Accts. Exch. K. R. bdle. 266, No. 2.

² Only £14 was received in this way in 1504 (Receiver's Roll, 18 Hen. VII).

³ Exch. K. R. Bailiffs' Accts. of Edmund of Cornwall, 24-25 Edw. I.

⁴ Receiver's Roll, 23 Edw. III.

⁵ In 1417, £13 7s. (Receiver's Roll, 5 Hen. V).

⁶ This right was exercised in the Derbyshire lead mines (*Cal. S. P. Dom.* Chas. I, cccxli, 629; cccxxvii, 5; cccx, 11; Add. MS. 6682, fol. 69).

⁷ Pipe R. 7 and 9 Ric. I, Cornw.

⁸ Ibid. 1 John, Cornw.

⁹ Exch. K. R. Bailiffs' Accts. of Edmund of Cornwall, 24-25 Edw. I.

¹⁰ Pat. 8 Edw. II, pt. i, m. 12, 29d.

¹¹ Chart. R. 33 Edw. I, m. 40.

¹² Close, 6 Edw. II, m. 23.

¹³ Cf. Pat. 8 Edw. II, pt. i, m. 12, 29d.

¹⁴ *Parl. R.* (Rec. Com.), i, 308.

¹⁵ Pat. 10 Edw. II, pt. i, m. 4.

¹⁶ Pat. 7 Edw. II, pt. ii, m. 10; 8 Edw. II, pt. i, m. 28d, 29d; 9 Edw. II, pt. i, m. 25d, sched. dorse; Close, 8 Edw. II, m. 7.

¹⁷ Pat. 10 Edw. II, pt. ii, m. 24, 28; Close, 14 Edw. II, m. 23.

¹⁸ Close, 12 Edw. III, pt. ii, m. 20, 23d, 25.

¹⁹ P. R. O. Exch. K. R. Accts. bdle. 263, No. 15.

²⁰ Pat. 21 Edw. III, pt. ii, m. 3. *Parl. R.* (Rec. Com.), ii, 168, 180, 203.

With a single exception²¹ the tinner were let alone until the seventeenth century, when, in a régime of monopolies, the preemption of the tin was exercised or farmed for the greater part of that century. The amounts which the Stuarts²² received for the farm of the preemption were exceedingly generous. Two thousand pounds were paid in 1601,²³ but, as the privilege was seen to be worth more, the rent was raised gradually to £12,000 per annum in 1628,²⁴ a sum far exceeding in amount that of all the other stannary receipts combined.

But the most important tax laid on the stannaries was the coinage dues, formed of a union of the ancient farm and of the king's mark. By 1305 these had become dissociated from the process of smelting and had been fixed at 4s. per hundredweight, assessed and paid at the coinage towns.²⁵ For a couple of centuries the affair took place at two periods in the year, Midsummer and Michaelmas, the approximate date being settled by the Duke of Cornwall,²⁶ but the minor arrangements by the three officers of the coinage. The receiver, the controller,²⁷ and the steward of the district in which the coinage was to be held, bearing the stamping hammer²⁸ and official weights, met at the towns the weigher,²⁹ the assay-master³⁰ (whose duty it was to ascertain the quality of each block of tin presented, by chipping a piece from the corner), and other minor officials and porters.³¹ Thither also came the mine owners, with their tin, while from London and the ports came the would-be purchasers. The tin was taken from the coinage-hall where it lay stored, weighed, assayed, and stamped, piece by piece, and a voucher given each owner.³² This as a rule the latter disposed of at a discount to the merchants,³³ who on paying the dues might call for the tin.³⁴

²¹ Pat. 7 Edw. VI, pt. iii; Lansd. MS. 76, fol. 34; S. P. Dom. Mary, iv, 5; Manuscript volume in Duchy of Cornwall Office, fol. 92.

²² Dewes, *Parliamentary Debates*, 647, S. P. Dom. Eliz. cclxxiii, 74; cclxx, 123; cclxxvi, 18; cclxxxvi, 26; Jas. I, xxxiii, 57; Audit Accts. Duchy of Cornw, 1646, Lansd. MS. 1215, fol. 226-230, Treas. Papers, ii, 44; ccviii, 30; Add. MS. 6713, fols. 432, 442.

²³ S. P. Dom. Eliz. cclxxxvi, 2.

²⁴ Lansd. MS. 1215, fols. 226-230.

²⁵ Chart. R. 33 Edw. I, m. 40.

²⁶ Cf. Pat. 9 Edw. III, pt. i, m. 8; Convoc. Cornw. 16 Hen. VIII, c. 31.

²⁷ S. P. Dom. Eliz. xlvii, 54.

²⁸ Ibid. Eliz. cvi, 55.

²⁹ Ibid. Also Pat. 12 Ric. II, pt. i, m. 3; 1 Hen. IV, pt. viii, m. 34; 1 Edw. IV, pt. ii, m. 21.

³⁰ Carew, *Survey of Cornwall*, (ed. 1811), p. 45, note. Treas. Papers, ii, 44.

³¹ S. P. Dom. Eliz. cvi, 55.

³² Lansd. MS. 18, fol. 52. *The Tinner's Grievance*.

³³ Hargrave MS. 321, fol. 41.

³⁴ S. P. Dom. Eliz. cvi, 54.

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To meet the difficulty that the ordinary coinages were insufficient to accommodate all the tin, existed 'post-coinages,' consisting of one or more supplementary coinages held by special warrant.¹ Tin stamped here paid an extra 4*d.*² on each hundred-weight, known as the 'fine of tinner's' or 'post-groats.'

Although the excessive practice of smuggling tin uncoined³ probably made serious inroads upon the coinage duties, nevertheless, until the preemption was set to farm, the coinage furnished the largest single item of revenue which Cornwall afforded. Over £1,500⁴ was in this way turned in in 1303, the amount rising and falling in wide fluctuations, according to the output. The fall in the value of money, and the almost stationary condition of the tin mining, from the thirteenth to the middle of the seventeenth century, had rendered their worth comparatively small, when in 1660 began a steady rise, which brought it in 1700 to £6,380,⁵ in 1710 to £9,600,⁶ and in 1750⁷ to £10,000 per annum.⁸

A glance at the regulations under which the tinner's plied their trade shows not only the close resemblance of the stannary organization to that of the mediaeval guild, but also its critical points of divergence from the latter; and explains how it happened that the stannaries, while retaining their strength, secured an elasticity which made it possible for the laws to persist, with but few modifications, until well into the nineteenth century. We find no spirit of exclusiveness and repression of improved processes, such as that which brought the English guilds to the ground. With the exception of a law forbidding blowers to smelt their own tin,⁹ little impediment was offered to the entrance of modern industrial methods, so that the advent of capitalism was early, and its development gradual.¹⁰

¹ Convoc. Cornw. 16 Hen. VIII, c. 31.

² In 1517, 1*s.* (Receiver's Roll, 9 Hen. VIII); in 1518, 8*d.* (Receiver's Roll, 10 Hen. VIII).

³ Pat. 7 Edw. II, m. 10*d.*; 8 Edw. II, pt. i, m. 28*d.*; 10 Edw. II, pt. ii, m. 17*d.*; 16 Edw. III, pt. iii, m. 14*d.*; 17 Edw. III, pt. i, m. 38*d.* 43*d.*; 18 Edw. III, pt. ii, m. 30*d.*; 21 Edw. III, pt. i, m. 25*d.*; pt. ii, m. 9*d.*; 1 Hen. IV, pt. viii, m. 14*d.*; Close, 7 Edw. II, m. 10; 8 Edw. II, m. 7; S. P. Dom. Eliz. ccxliii, 113; Jas. I, clxxxvii, 26; Treas. Papers, ii, 10; xi, 10.

⁴ P. R. O. Exch. K. R. Accts. bdle. 264, No. 24.

⁵ Receiver's View, 1700.

⁶ Ibid. 1710.

⁷ Ibid. 1750.

⁸ The Civil War brought with it the final extinction of tribulage, dublet, and the fine of tin; but the coinage and post-coinage dues, supplanted by an excise tax under the Commonwealth, were revived at the Restoration, and continued in force until 1837.

⁹ Arthur's Ordinances (Add. MS. 6713, fols. 101-104).

¹⁰ On the other hand, the miners of the Forest of Dean formed a close corporation, which admitted no outsiders to membership, and endeavoured to prevent the growth of large mining enterprises. See Houghton, *The Compleat Miner*, pt. ii, art. 1-3, 30,

These rules were possibly as old as the mines themselves, but as we have no records of the parliaments of the stannaries previous to the sixteenth century, and as the presentments in the stannary court rolls are of the briefest possible description, in default of further information we must content ourselves with that furnished by the acts of the parliament of comparatively recent years, leaving it open to conjecture whether the laws there laid down are merely confirmations.

Some of these regulations have been cited already. We have seen, for example, how the stannaries punished tinner's for not using the proper courts, or how in various ways they laid down the manner in which a claim should be bounded. Other rules are here and there to be found. Penalties were attached to tollers, owners of blowing-houses and blowers, and others, who should make default of their service at the 'law day,'¹¹ and to tinner's who should seek, through legal technicalities, to escape their stannary obligations, including that of jury service at the courts,¹² and militia service at the musters.¹³ Efforts also were made by the courts and parliaments to prevent disputes between tinner's arising out of the working of their respective bounds. Of such was the act forbidding 'bounding upon bounds.'¹⁴ Another prohibited the dumping of rubbish on other men's works,¹⁵ and a further order declared that rubble and sands should be deposited in old shafts and pits.¹⁶ Repeated ordinances forbade the sinking of shafts upon public highways.¹⁷

The washing of the ore was subject to restrictions, the object of which was to ensure publicity of work, and to guard the interests of all partners in a mining enterprise. The working of 'private buddles or dishing-places in any secret place' was punishable by a fine.¹⁸ Warning of the wash and division of ore must be given the landlord¹⁹ and all the partners²⁰ in the mine, while a commentary on the rough, semi-lawless character of the population is the custom which forbade the wearing of arms, either at tin works or at washes.²¹ It was there only that one might purchase ore. 'No man,' so the

36, 37; *Fourth Report of the Dean Forest Commission* (1835), 6, 8-10, 13, 14; *Award of the Dean Forest Commissioners*, 17, 19, 21.

¹¹ Add. MS. 6713, fol. 242.

¹² Convoc. Cornw. 22 Jas. I, c. 15.

¹³ Ibid. 30 Eliz. c. 6.

¹⁴ Ibid. 16 Hen. VIII, c. 13.

¹⁵ Pearce, *Laws and Customs of the Stannaries*, 204.

¹⁶ Add. MS. 6713, fol. 191.

¹⁷ Convoc. Cornw. 16 Hen. VIII, c. 33; Add. MS. 6713, fol. 248.

¹⁸ Add. MS. 6713, fol. 237.

¹⁹ Ibid. fol. 236.

²⁰ Cf. Harl. MS. 6380, fol. 48.

²¹ Convoc. Cornw. 12 Chas. I, c. 31. Cf. 'Certain Peculiarities in the Old Mining Law of Mendip,' by C. Lemon. *Trans. Roy. Geol. Soc. Cornw.* vi, 333.

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law reads, 'ought to buy or receive any black tin, otherwise than openly, at a wash, from the sheet, nor buy or receive any tin shift, or the leavings of blowing-houses, from any suspicious person that is not known to be an adventurer for tin, a worker of white tin, or owner in a blowing-house.'¹ In later years this rule was supplemented by one which compelled the presence of two witnesses at each sale, and the entry on the book of the blowing-house where the tin was to be smelted of the names of the person from whom it was purchased, and the amount; and the blowing-house books were to be open to the inspection of any who desired.²

Ore which had passed the wash, and perhaps had already changed hands once, was still subject to the control of the central authorities. Each owner was made to register a private mark at the stannary exchequer at Lostwithiel,³ and on the court book in his own stannary district.⁴ Each proprietor of a blowing-house also must register his private mark,⁵ and must not employ a blower (or, after 1752, a smelter) without having first presented him at the steward's court, there to be sworn to use himself according to his vocation, and without corrupting or mingling tin in deceitful manner.⁶ The reason may be seen in the fact that the blowing-house, by reason of its technicalities of operation, offered strong temptations to unjust dealing. Several qualities of tin were possible: soft or standard merchantable tin, hard tin, pilian tin, cinder tin, and relistian tin, each a grade poorer than the one above. According to law, every block had to be stamped by the blower with the initial letter of its quality,⁷ and, besides, with the owner's mark, and the mark of the blowing-house. In case a dealer found that he had been cheated, he might return a piece of the tin containing the marks of identification. The sample was melted in court, and, if bad, the original owner was obliged to recompense the dealer, and forfeit his tin to the prince, besides paying a fine,⁸ while the blowing-house owner was dealt with in proportion as it could be proved that the misdemeanour had been due to his negligence or connivance.⁹ But for the blower himself no excuse might avail, and he was fortunate if he escaped with a fine of £5.¹⁰ If, on the other hand, the tin proved good, the complainant himself

was fined.¹¹ A further Act imposed penalties upon any merchant who connived with the owner of tin to conceal its falsity.¹²

These regulations were based upon the assumption, not only that the merchant should be protected against fraud on the part of the tinner, but that the whole consuming public had an interest in the blocks being what they were represented. This explains two further restrictions. No person owning blowing-house or crazing or stamping-mill might allow irresponsible persons to 'knock braws, rocks, or any other stuff whereof tin might be made, black or white, without the said owners will answer for the same tin.'¹³ Pewterers and plumbers were not to be sold 'ashes, skimpings,' or other leavings of the blowing, under penalty of a fine to buyer and seller.¹⁴

At the coinage, again, the tinner was hedged about by rules designed not only to protect the consumer, but to guard against the loss of duchy revenue. To ensure that no tin left the blowing-house without being brought to the coinage town, the blowing-house owner at each coinage was made to deposit at the stannary exchequer at Lostwithiel a bill certifying, with the names of the owners, how many pieces of tin he had blown.¹⁵ The conveying and selling of uncoined tin was punished by imprisonment, confiscation of the metal, and satisfaction to the prince in the shape of a fine.¹⁶ In the later Stuart period, coincident with the efforts to put down smuggling by the appointment of supervisors of blowing-houses,¹⁷ ordinances appear prescribing the disposal of the tin after smelting. No carrier was to take any tin above one pound in weight from the blowing-house, otherwise than by the direct and common road from blowing-house to coinage town;¹⁸ the journey must be made between sunrise and sunset;¹⁹ the shortest road was to be taken, and a reasonable time only allowed for the trip.²⁰

One more rule remains to be noted, namely, the persistent enactments against the conveying of shares in a tin work to wealthy or powerful men, for the purpose of getting their assistance at law or in other ways,²¹ a provision similar to

¹ Convoc. Cornw. 22 Jas. I, c. 24.

² Ibid. 12 Chas. I, c. 21.

³ Prince Arthur's Ordinances of 1495 (Add. MS. 6713, fol. 101).

⁴ Convoc. Cornw. 16 Hen. VIII, c. 18.

⁵ Prince Arthur's Ordinances of 1495 (Add. MS. 6713, fol. 101).

⁶ Convoc. Cornw. 16 Hen. VIII, c. 17.

⁷ Ibid. c. 20.

⁸ Ibid. 12 Chas. I, c. 10.

⁹ Harl. MS. 6380, fol. 33.

¹⁰ Convoc. Cornw. 12 Chas. I, c. 10; cf. Add. MS. 6713, fol. 242.

¹¹ Add. MS. 6713, fol. 243.

¹² Ibid.

¹³ Ibid. fol. 279. Presentment of the grand jury of Penrith and Kerrier, 1636.

¹⁴ Convoc. Cornw. 12 Chas. I, c. 11.

¹⁵ Prince Arthur's Ordinances of 1495 (Add. MS. 6713, fol. 101).

¹⁶ Convoc. Cornw. 16 Hen. VIII, c. 14.

¹⁷ *Cal. Treas. Papers*, i, 13; *Treas. Papers*, ii, 10; xi, 10.

¹⁸ Convoc. Cornw. 2 Jas. II, c. 17.

¹⁹ Ibid.

²⁰ Ibid.

²¹ Convoc. Cornw. 16 Hen. VIII, c. 11; *Parl. Devon*, 2 Hen. VIII, c. 11. This ordinance appears in Derbyshire (Houghton, *The Compleat Miner*, p. 22; *Compleat Mineral Laws of Derbyshire*, pt. 1, art. 24).

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the prohibition of liveries¹ among tanners, and affording an insight not only into the unscrupulous practices at times resorted to, but perhaps as well the early forms assumed by capitalistic enterprise.

From this sketch of stannary administration we may now turn to the operations of the industry itself, the nature and distribution of the mines, the excavation of the ore, its smelting, and the disposal of the refined product. At the outset, attention should be called to the absolute amounts of tin put upon the market from year to year. Already it has been noticed that the yield, judged from modern standpoints, was small; yet until the reign of Charles II little permanent increase was obtained over the amount produced in 1214. The industry seems to have been subject, in some inexplicable way, to long waves of activity or of depression.

Although the story of the wealth which Richard of Cornwall is said to have drawn from his tin-mining prerogatives cannot be confirmed, a decline is evident in the output of tin during the last quarter of the thirteenth century and the first years of the fourteenth. The production in Devon fell from 87 thousand-weight in 1291,² to 38 in 1296.³ That of Cornwall was but 560 thousand-weight in 1301,⁴ and although it had risen to 863 in 1306,⁵ it was far below its level of the previous century.⁶

Whether or no it was the economic situation of the miner which gave rise to the charter of 1305, its issue was followed by a mining 'boom,' interrupted only by the Black Death, the amount from Cornwall in 1337,⁷ namely, 1,328 thousand-weight, proving the greatest yield on record. The plague, however, almost ruined Cornwall. Thorold Rogers does not believe that the Black Death extended into the extreme western parts of England.⁸ He might have been of another opinion had he seen the stannary tax-rolls for the years immediately before and after 1350. A

single instance will suffice. Tribulage produced in 1349 £1 10s. 3d.;⁹ in 1350, 15s. 8d.;¹⁰ and in 1357 only 9s. 4d.¹¹ The actual amount of tin mined in 1355 from Cornwall was but 496 thousand-weight,¹² nor was it until about 1390 that affairs began to improve.¹³ So great, indeed, appear to have been the ravages of disease among the miners, that the Prince of Wales was obliged to make proclamation that no tinner or owner of shares in a tin work should neglect to bestow upon it as much labour and expense as had hitherto been usual.¹⁴

A third period of depression began in, and lasted through, the fifteenth century, the production, which in 1400 had been almost sixteen hundred thousand-weight,¹⁵ falling to eight hundred in 1455,¹⁶ and not rising much above a thousand until forty years later.¹⁷ In the first half of the sixteenth century the yield slightly increased, averaging over sixteen hundred thousand-weight,¹⁸ until Elizabeth's reign, when it fell again to small proportions and so continued¹⁹ until the period of the Commonwealth, dying out completely during the Civil War.²⁰ Then, for reasons to be named later, began a renewed activity in tin mining, and the annual production mounted steadily, until the maximum was reached some decades ago.

What were the conditions under which all this metal was produced? Cornwall's chief geological features consist of a central ridge of rock which runs longitudinally from east to west, throwing out ramifications that meet the sea, on either side, in the rugged outlines that render the country so attractive to the tourist and the artist. This ridge gives rise to numerous streams, flowing, for the most part, from north to south, and traversing small valleys, broadening out at places into moorlands of considerable extent. Here it was that tin mining had its birth.

Tin ore occurs either in veins in rocks, or in the form of gravel or sand, in alluvium. The detrital tin deposits are easily explained. The lodes have been degraded, and their contents washed out. The specific gravity of tin ore is so high (6·8), that, as the carrying force of the water moderated, it sank to the bottom in beds.²⁰

¹ Prince Arthur's Ordinances of 1495 (Add. MS. 6713, fol. 101).

² Pipe R. 23 Edw. I, Devon.

³ Ibid. 29 Edw. I, Devon.

⁴ Ibid. Cornw.

⁵ Exch. K. R. Duchy of Cornw. Accts. port. 5.

⁶ Due, possibly, to the banishment of the Jews from England in 1290. The question as to the presence of Jews in the tin mines is one which admits of no satisfactory answer. The probabilities, however, seem to point to their playing an important part in the industry. The question as to the derivation of the name 'Marazion' may be neglected, but the ordinances issued by De Wrotham in 1198 are made to apply explicitly to both Christians and Jews. Abraham the Tinner in 1342 owned a number of stream works in Cornwall (Smirke, *Vice v. Thomas*, App. p. 25), and the county as a whole did not lack Hebrew names among its inhabitants in the Middle Ages. ('The Jews in Cornwall,' by J. Baumeister, *Journ. Roy. Inst. Cornw.* Oct. 1867, 324-331.)

⁷ Exch. K. R. Duchy of Cornw. Accts. port. 1.

⁸ *Hist. of Agriculture and Prices*, i, 601-602.

⁹ Mins. Accts. 23 Edw. III.

¹⁰ Ibid. 24 Edw. III.

¹¹ Ibid. 31 Edw. III.

¹² Receiver's Roll, 29 Edw. III. In Devon apparently every mine shut down.

¹³ P.R.O. Exch. K. R. Accts. bdle. 263, Nos. 21, 22.

¹⁴ White Bk. of Cornw. 25 Edw. III, Feb.

¹⁵ Receiver's Roll, 1 Hen. IV.

¹⁶ Ibid. 33 Hen. VI.

¹⁷ Ibid. 11 Hen. VII.

¹⁸ Receiver's Roll.

¹⁹ Duchy of Cornw. Audit Accts. 1646-1648.

²⁰ 'The Antiquity of Mining in the West of England,' by R. N. Worth, *Journ. Plymouth Inst.* v, 126; Worth, *Historical Notes concerning the Origin and Progress of Mining Skill*, 5, 8-10; Pryce, *Mineralogia Cornubiensis*, 66.

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This is the origin of the 'stream tin' deposits in the valleys of Cornwall, especially those to the south of the watershed, and, to a lesser extent, in the valleys of the Dartmoor rivers.

Probably attention was first directed to deposits of stream tin by an agency similar to that leading to their formation. Streams and rivers, swollen by rains, would cut deeper gutters through the alluvium of their valleys, and expose layers of tin stones, pebbles, and gravel. What was thus shown to occur in several valleys would be anticipated and sought in similar situations elsewhere, although the surface indications might not precisely correspond or be so decisive; and, by degrees, discovery would become an art. Nor could stream works be long in operation without some evidences of their connexion with the lodes in adjacent hills. The early miners might not recognize the fact that the quantity of tin stone washed down into the valleys and moors was a measure of the denudation of the more elevated regions of the country; but they could not fail, as they worked upward, to discover some traces of the veins from which stream tin had been derived. Hence, unquestionably, arose the practice of 'shoding.'¹

'The ores of tin,' wrote Pryce in 1778,² 'are shode, stream, and mine. The shode is adjacent to and scattered to some distance from its parent lode, and consists of pebbly and smoothly angular stones of various sizes, from a half-bunce to some pounds in weight. Stream tin is the same as shode, but smaller in size and arenaceous, and in that state is formed of small pyramids of various planes, broad at the base and tapering to a point at the top. Stream tin ore is the smaller loose particles of the mineral detached from the bryle, or backs of sundry lodes, situated on hilly ground, and carried down into the vales by the retiring waters of the floods. In the solid rock of the valley there is no tin ore, but immediately upon it is deposited a layer of stream tin of various thicknesses, perhaps over that a layer of earth, clay, or gravel, and upon that another stratum of tin ore, and so on successively, stratum on stratum, according to their gravity, and the different periods of their coming. Mine ore,' he goes on to say, 'is the original lode, buried usually in rocky substances in the hills or the cliffs.'

We cannot end this description of the tin beds, so essential to the proper understanding of the history of Cornish mining, better than by an account of an old stream work discovered about a century ago, and mentioned by the historian Polwhele. 'They (the Porth stream works) were situated near the shore of Trewardreth Bay; the ore was of the purest kind, and contained two-thirds metal. The pebbles from which

the metal was extracted were in size from sand-like grains to that of a small egg. They were included in a bluish marl, mixed with sand and containing various marine excuviae. The depth of the principal bed was nearly twenty feet, and its breadth six or seven. This appears to have been worked at a very remote period, and before iron tools were employed, as large pickaxes of oak, holm, and box, have been found there. In St. Blazey, St. Austell, St. Stephen in Brannel, and St. Ewe, are many old stream works which men commonly attributed to Jews. The most considerable stream of tin in Cornwall is that of St. Austell Moor, which is a narrow valley about a furlong wide (in some places somewhat wider) running nearly three miles from the town of St. Austell southward to the sea. On each side, and at the head, above St. Austell, are many hills, betwixt which are little valleys, which all discharge their waters and whatever else they receive from the higher grounds into St. Austell Moor, whence it happens that the ground of this moor is adventitious for about three fathoms deep, the shodes and streams from the hills on each side being here collected and caught into floors according to their weight and the successive dates of their coming thither. The uppermost mat consists of thin layers of earth, clay, and pebbly gravel, about five feet deep. The next stratum is about six feet deep, more stony, the stones pebbly formed, and with a gravelly sand intermixed. These two coverings being removed they find great numbers of tin stones from the bigness of a goose-egg, and larger, down to the size of the finest sand. The tin is inserted in a stratum of loose, smooth stones, from a foot diameter down to the smallest pebbles. From the present surface of the ground to the solid rock or "karn" is eighteen feet deep at a medium. This stream tin is of the purest kind, and a great part of it, without any other management than being washed on the spot, brings thirteen parts for twenty at the melting-house.'³

From the shallowness of the stream-tin deposits and the comparative ease with which they could be shovelled out, as contrasted with the difficulties of driving shafts through the rock, it goes without saying that of the two methods the former was the first to be employed. All discoveries of ancient tin mines have been made in diluvial ground,⁴ and it may be stated with some degree of certainty that stream tinning prevailed in the early and the mediæval periods, to the exclusion of lode mining, save possibly when the latter was carried on upon remarkably rich lodes and in shallow depths.⁵ A few facts may be cited in support of this statement. The composition

¹ Polwhele, *Hist. of Cornw.* bk. 2, p. 10.

² Worth, *Historical Notes concerning the Progress of Mining Skill*, 5.

³ Pryce, *Mineralogia Cornubiensis*, 66.

⁴ For an example of this see 'Description of a Stream Work at Drift Moor, near Penzance,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iv, 47-56.

⁵ Polwhele, *Hist. of Cornw.* i, Supplement, 64.

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of the tools of the ancient and mediaeval tinner which, as we have just seen, were of wood and unfitted for piercing rock; the fact that whenever mention is made of the specific nature of a tin work it is invariably described as a moor or stream work and never as a mine work;¹ the mining customs of Cornwall which, in their total lack of provision for the occurrence of veins of mixed metals, are evidently adapted only to stream-tin works—all point to this as the proper solution of the question.

Similar conclusions may be drawn from the continual complaints in which the landlords set forth the destructiveness of the stannary works to their crops. A single example will suffice. In 1361 John of Treeures complains to the prince and his council 'that, whereas the tinner have warrant of the Prince to dig and raise tin where they can find it, and have dug and collected it for a long time on the moor waste of the said John and his ancestors in the vill of Treeures, who received from the tinner a third part of the tin for toll, according to ancient ordinance, for the damage done to the lord of the place; but now of late more than sixty tinner have entered on his demesne and have conducted water to the vill of Treeures over his demesne and soil, so that by reason of the great quantity of water they deluge the land there where they work upon the moor, and nothing remains of the good land there but stones and gravel, so that corn will not grow there; that the tinner refuse to give more toll for waste done to the demesne than for damage on the waste moor; wherefore the said John prays, for the love of Christ, that you may be pleased to ordain a remedy, that is to increase the toll in the demesne beyond the toll in the waste in proportion to its greater value.'² Complaints of this sort, so numerous during the Middle Ages,³ could not have been occasioned by the driving of shafts in rocky edges, but by the wholesale upturning of the soil by trenching and excavating for alluvial deposits.

Finally we may have recourse to a quasi-mathematical argument. Stream tin, as we know from the testimony of Thomas Beare,⁴ was considered far superior in quality to mine tin. Three foot-fates of the former (about eight quarts)⁵ sufficed for 105 pounds of refined

metal. If we turn now to the account given in the sole surviving Pipe Roll of Edmund of Cornwall of that earl's operations with regard to the preemption of the black tin in 1297⁶ we find that, having purchased the black tin at 18*d.* the foot-fate, to produce a thousand-weight of white tin he used twenty-eight and one-half feet of ore, figures which almost exactly tally with the account of the stream tin given by Beare three centuries later. The inference is that Edmund's tin (and he seems to have preempted the entire output) was obtained from stream works.

With the progress of tin mining during the Middle Ages the scene of operations shifted steadily from the east to the west. During the twelfth century the rich Devon stream works produced almost all the tin used in Europe, and Cornish mining, such as it was, lay near the Devon boundary. In 1198 De Wrotham on occasion of his reforms held two inquests, at Exeter and at Launceston. In Devon he had twenty-six witnesses and in Cornwall only eighteen,⁷ facts which indicate fairly clearly about what centres most of the mining was conducted. Devon tin however was soon exhausted, and in the thirteenth century Cornwall came to the forefront.⁸ Devon, which in 1189 had produced over 600 thousand-weight,⁹ had produced only seventy-four in 1243,¹⁰ and although in later centuries it sometimes exceeded this amount, Cornwall never failed to maintain its preeminence with the greatest ease.

In the latter county the centres of activity moved ever to the west. In 1305, out of a total yield for Cornwall of 850 thousand-weight, the tin coined at Lostwithiel and Bodmin, the two eastern markets, amounted to 716 thousand weight, while the western parts, represented by Helston and Truro, produced only 134.¹¹ During the forty or fifty years of accounts during the reigns of Elizabeth and James I,¹² however, the average annual product of the two eastern stannaries, as represented by the coinage at Lostwithiel and Liskeard, was but 135 thousand-weight as compared with 807 for the west.¹³ Penzance, in the Land's End district,

⁶ Exch. K. R. Bailiffs' Accts. of Edmund of Cornwall, 24-25 Edw. I.

⁷ Black Book of the Exchequer, No. 10.

⁸ In 1220 the Devon stannaries were farmed for but 200 marks, while those of Cornwall brought five times as much (Pat. 5 Hen. III, m. 4, 8; Close, 5 Hen. III, m. 8, 9; 9 Hen. III, m. 4, 9; 10 Hen. III, m. 27; Fine R., 5 Hen. III, m. 7).

⁹ Pipe R. 1 Ric. I, Devon.

¹⁰ Ibid. 27 Hen. III, Devon.

¹¹ P. R. O. Exch. K. R. Accts. bdle. 261, Nos. 1 and 2.

¹² Receiver's Rolls.

¹³ An examination of the tribulage accounts (Mins. Accts. Duchy of Cornw.) shows an enormous increase in tinning in the Penwith and Kerrier district, and a falling off in Blackmore in the east.

¹ See Smirke, *Vice v. Thomas*, App. 26, citing from the White Book of Cornwall, the complaint of Henry Nanfan; also *Proceedings in the Chancery of Elizabeth*, i, p. xiii. It should be noted also that the statutes of Henry VIII against the choking of the rivers with silt from the tin mines, refers expressly to stream works as the offenders (Stat. 23 Hen. VIII, c. 8; 27 Hen. VIII, c. 23; P. R. O. Ct. R. bdle. 159, No. 26).

² Smirke, *Vice v. Thomas*, App. 25, citing the White Book of Cornwall.

³ *Parl. R.* (Rec. Com.), i, 297, 312, 382; ii, 190.

⁴ Harl. MS. 6380.

⁵ Harl. MS. 6380, fol. 35.

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was first made a coinage town in 1663,¹ and in 1778, according to Pryce, coined more tin each quarter than all the towns of Liskeard, Lostwithiel, and Helston for a whole year,² and the shifting of tinning toward the west even more recently is shown by the fact that in 1892, while the output for West Cornwall was 7,751 tons, that of East Cornwall was but 628 tons, while Devon produced only ninety-six.³

For detailed accounts of former methods of prospecting we cannot go behind the seventeenth century. But it must be constantly borne in mind that the mining customs and practices of Cornwall, even to-day, antedate, in many cases, all printed records, and that we shall therefore not be far wrong in ascribing the primitive methods in use in the seventeenth century to the Middle Ages, or even earlier.

If we omit from consideration the use of the divining-rod,⁴ dreams,⁵ and other popular superstitions, as guides to the deposits of tin, we shall find that the tinner's first aim was to discover 'shodes,' or tin-stones.⁶ An anonymous Cornishman writing in 1671 states:—

'Where we suspect any mines to be, we diligently search that hill and countrey, its situation, the earth or grewt, its colour, and nature, and what sort of stones it yields; the reason thereof being only this, that we may the better know the grewt and stones when we meet with them at a distance, in the neighbouring valley; for mineral stones may be found 2, 3, 4, 5 miles distant from the hills or loads they belong unto.

'After any great land flood (in which it is supposed there are some new frets made in the sides of the banks), we go and diligently observe such frets . . . to see if, happily, we can discover any metallic stones in the sides or bottoms thereof . . . which is a great help to direct us which side or hill to search into. Neither will it be much amiss in this place to subjoyn the few but sure characters of mineral stones, by which we know the kind of metal, and how much it yields. The first is, by its ponderousness, which easily informs us whether it be metal or no. The second is its porosity, for most tin-stones are porous, not unlike great bones, almost thoroughly calcined; yet tin sometimes lies in the firmest stones. The third is by water, which we term vanning, and that is performed by pulverizing the stone, or clay, or what else may be suspected to contain any mineral body, and placing it on a vanning shovel; the gravel remains in the hinder

part and the metal at the point of the shovel, whereby the kind, nature, and quantity of the ore is guessed at; and indeed, most commonly without any great deception, especially if the vanner have any judgement at all.

'But if no shoad may be found in such frets, . . . then we go to the sides of those hills most suspected to have any loads in them, where there may be a conveniency of bringing a little stream of water . . . and cut a leat or trench, about 2 foot over, and as deep as the shelf, in which we turn the water to run two or three dayes; by which time the water, by washing away the filth from the stones and the loose parts of the earth, will easily discover what shoad is there. If we find any, we have a certainty of a load. . . . Sometimes shoad may be found upon the open surface of the ground, as being thrust up by moles in their hillock, or turned up by the plow, or by some other accident; for it is seldom found on the open surface of the ground unless brought there by an accident. . . .

'When all these ways have been attempted for finding shoad, if we find any, it makes us proceed with the greater confidence, having an assurance of load; but in case we find not any, then we must go by guess. . . . In the next place we sink down about the foot or bottom of the hill an Essay hatch (an orifice made for the search of a vein, about 6 foot long and 4 foot broad) as deep as the shelf. And it is observable they are always to be as deep as the shelf, for this reason, that otherwise you may come short of the shoad. But if we meet with none before, or when we come to the shelf or fast countrey there is none to be expected; yet sometimes the shoad is washed away clean, when you come within 2 or 3 foot from the load, and then the load is a foot or two farther up the hill. If we find any shoad in this first Essay hatch, our certainty is either increased, if any shoad were found before, or begun. Neither doth it add a little to make a right conjecture, how high up the hill or how far off the load . . . is, carefully to mark how deep from the surface of the earth our shoad lies; for this is held an infallible rule, that the nigher the shoad lies to the shelf, the nigher the load is at hand, and vice versa.

'Albeit we finde no shoad in this first hatch, having found some before by the ways aforementioned, or having found none, we are not . . . altogether discouraged; but ascend commonly about 12 fathom and sink a second hatch, as the former. And in case none appear in this, we go then as many fathom on each hand, at the same height, and sink there as before, and so ascend proportionally with three or more hatches (if the space of ground requires) as it were on brest, till we come to the top of the hill, and if we find none in any of these hatches—then farewell to that hill.

'But if we find any shoad . . . we keep our ascending hatches in a direct line; and as we draw nearer the load the deeper the shoad is from the surface, but the nigher the shelf. . . .

'Sometimes it falls out that we may overshoot a load, that is, get the upper side of it, and so we loose it; for which we have another . . . rule, viz., that finding shoad lying near the shelf

¹ Pearce, *Laws and Customs of the Stannaries*, 103.

² Pryce, *Mineralogia Cornubiensis*, 293.

³ 'The Tin Trade of Cornwall in the Reigns of Elizabeth and James,' by Sir John Maclean, *Journ. Roy. Inst. Cornw.* iv, 189; xiii, pt. iv, p. 432.

⁴ 'Mineral Observations on the Mines of Cornwall and Devon,' *Philosoph. Trans.* vi, 2101.

⁵ Childrey, *Britannia*, p. 6.

⁶ Carew, *Survey of Cornwall* (ed. 1811), pp. 8, 9;

'Mineral Observations on the Mines of Cornwall and Devon,' *Philosoph. Trans.* vi, 2097-2098.

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in this hatch, and finding none in the next ascending, we have overshot our load. The remedie is easie, which is to sink nigher the hatch wherein we last found shoad.¹

The first form assumed by the ancient mines was that of pits open to the sky, the mineral at this early stage cropping out at the surface, and requiring only to be shovelled out like gravel, or else hewn in blocks.² This method has been followed where suitable almost continuously ever since the date of its adoption, examples being at hand in Carclase, near St. Austell,³ and the Gwennap pit at the present day.⁴

Another form of 'daylight mining' is that of following the course of lodes, by trenches known as 'coffins.' A good instance of the survival of this method is still to be found in the Goonbarrow lode, a little to the north of Rock Hill, near St. Austell.⁵

'Costeaning' was still another mode of procedure adopted by the early miners, much as it was used, centuries later, by the tanners of Banca, in the East Indies.⁶ A succession of small pits was sunk, from 6 to 12 feet deep, and drifts carried from one to the other across the direction of the veins or tin layers.⁷

Probably subsequent to the introduction of these methods came that of the 'shammel,'⁸ which seems to have been a mode of transition from open workings to mining proper, and was carried on both in the open pits and underground, in stream works or in lodes. It is, perhaps, best described by the anonymous writer previously quoted. The lode found,

'we sink down about a fathom, and then leave a little long square place called a shamble, and so continue sinking from east to east (i.e. as high as a man can conveniently throw up the ore with a shovel), till we find the lode grow too small, or degenerate into some kind of weed. . . . Then we begin to drive either west or east as the goodness of the lode, or convenience of the hill invite, which we term a shift, 3 foot over and 7 foot high, so a man may stand upright and work, but in case the loade be not broad enough of itself, as some are scarce $\frac{1}{2}$ foot,

then we usually break down the deads, first on the north side of the loade . . . and then we begin to rip up the loade itself.'⁹

The shaft was thus divided into a series of step-like stages, each so high that a man could conveniently heave stuff from one to the next above with a shovel.

All of these processes proving useless for the discovery and raising of any tin beyond a certain shallow depth, it became necessary to contrive some other way to follow downward the tin-stone. Thereupon they sunk shafts down upon the lode, to cut it at some depth, and then to drive and stope, east and west, along its course. Thus, by a process of gradual transition, there crept in the system of lode mining such as exists to-day in Cornwall, to the exclusion of almost every other method.¹⁰

Shaft mining of some sort is probably of great antiquity in Cornwall, although Pryce did not think it had been introduced earlier than the year 1450.¹¹ But although we may, perhaps, admit the existence in Cornwall in early times of examples of mining in the modern sense, the tin was probably for the most part still obtained from alluvial deposits, and the shafts were no deeper than was necessary to reach the layer of stanniferous gravel. The transitional period, during which the approaching exhaustion of the stream works rendered necessary the tapping of the lode itself, occurred probably in the sixteenth and seventeenth centuries.¹² At about this period we find unmistakable signs that mining was being pursued at depths which taxed to their utmost the rude machines for drainage. Stream works were all of limited depth,¹³ it being a question merely of digging to the bed rock through the substratum, a distance varying according to the locality, but which could not well be greater than 50 or 60 feet. Thirty-six feet is the depth to which the miners had driven a tin stream work exhumed about half a century ago,¹⁴ and,

¹ 'Mineral Observations on the Mines of Cornwall and Devon,' *Philosoph. Trans.* vi, 2102; Pryce, *Mineralogia Cornubiensis*, p. 141. For examples of old shammel works, see Polwhele, *History of Cornwall*, bk. 2, p. 10, note; bk. 1, p. 175.

² 'Mineral Observations on the Mines of Cornwall and Devon,' *Philosoph. Trans.* vi, 2097-2100.

³ This seems to have been the case in Derbyshire (Farey, *General View of the Agriculture and Minerals of Derbyshire*, i, 358. See also Galloway, *Annals of Coal Mining and the Coal Trade*, 19, 191).

⁴ Hunt, *British Mining*, 418.

⁵ Worth, *Historical Notes on the Origin and Progress of Mining Skill*, 10.

⁶ Ibid. 11.

⁷ Le Neve Foster, *Banca and its Tin Stream Works*, 57.

⁸ Worth, *Historical Notes on the Origin and Progress of Mining Skill*, 7; Borlase, *Natural History of Cornwall*, 166; Pryce, *Mineralogia Cornubiensis*, 124, 166; Polwhele, *History of Cornwall*, i, Supplement 63.

⁹ This method was known to the lead miners of Derbyshire (Farey, *General View of the Agriculture and Minerals of Derbyshire*, i, 359).

¹⁰ Pryce, *Mineralogia Cornubiensis*, 141. Shaft mining was surely employed somewhere in England as early as 1366, for Bartholomaeus Anglicus, who wrote in that year, has described it in terms which show that it had already passed its infancy (Bartholomaeus Anglicus, *De Proprietatibus Rerum* (ed. 1582), p. 212).

¹¹ Thomas Beare (Harl. MS. 6380) speaks only of stream tinning in 1586; Carew, in 1602, refers to both methods; and Merrest and the anonymous writer already cited refer only to lode mining (*Philosoph. Trans.* vi, 2107; xii, 949).

¹² 'The Antiquity of Mining in the West of England,' by R. N. Worth, *Journ. Plymouth Inst.* v, 131-134.

¹³ 'Description of the Stream Work at Drift Moor, near Penzance,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iv, 47-56.

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from what has already been said, we know that tin gravel might be found at still slighter depths, in fact immediately beneath the surface.

With the advent of shaft mining in the rock, however, all this became changed, and pits were sunk 40, 50, and occasionally 60 fathoms.¹ At once the question of drainage assumed the importance which has clung to it ever since.² In the old stream works, wooden bowls seem to have been used at first for bailing purposes,³ or the 'level,' a deep trench, running from stream work to river, served to clear it of water.⁴ After that came the windlass, as yet turned by human power, and bearing up the water in leathern bags or buckets,⁵ and then the use of small hand or force pumps,⁶ and, at the same time, in the larger works, the adit,⁷ similar to the level, but in the form of a drainage tunnel, driven through the hillside to meet the shaft at its foot. The adit, however, was too expensive an undertaking to be within reach of all, and, even where employed, its usefulness was limited, since when the shaft was driven deeper than the level of free drainage, other devices had to be used to bring the water to the adit head. Meanwhile the windlass took various developments as regards application of power, the best-known being the horse whimsey, or whim, in which the rope from the shaft passed around a huge upright drum, turned by a team of horses.⁸ In other mines recourse was had to rag-and-chain pumps, each consisting of an endless chain, broadened at intervals by leathern bindings, to fit snugly into a long pipe of from 12 to 22 ft. in length. It was worked by a windlass at the surface, and catching up as it did a series of short columns of water, served quite well to clear a small mine, its chief drawback being the severity of the labour

which it entailed on the men working it.⁹ To drain a mine of any depth, a series of these was necessary, and a 4-inch pump drawing 20 ft. employed from twenty to twenty-four men working five or six at a time in six-hour spells.¹⁰

For the introduction of hydraulic drainage engines it is impossible to fix a date. They took the form usually of overshot waterwheels of 10 or 15 ft. diameter, turning in shallow shafts and operating rag-and-chain pumps, or their improvements the plate-and-chain and the bucket-and-chain. In deep mines, a half-dozen of these wheels, one above another, might be called into service. It is equally out of the question to attempt to say when each of the above drainage devices came into use, flourished, and disappeared. All have been used side by side. The level, which had probably been familiar from prehistoric times,¹¹ was practicable only in the most shallow works. The introduction of the adit in the stannaries cannot be traced back beyond the beginning of the seventeenth century,¹² although Carew in 1602 refers to it in terms which seem to imply that it was at that time no innovation.¹³ Rag-and-chain pumps appear first at a somewhat later period.¹⁴ The typical mine described in *Philosophical Transactions* in 1671 would seem to have been drained, when on the hillside, by an adit, to which the water was lifted by windlass and buckets, while if it were on a plain the latter arrangements alone could be relied upon.¹⁵ At the close of the eighteenth century the famous Wherry Mine at Penzance was drained by a rag-and-chain pump, worked by thirty-six men, a mode of drainage still resorted to in shallow pits.¹⁶

Apart from the forms assumed by drainage, certain other features of the early tin mine deserve mention. For raising the ore and rubbish, buckets or 'kibbles' were used in Carew's time,¹⁷ and have in some cases been employed ever since. In the older mines a simple windlass lifted and

¹ 'The Relation of Tin Mines and the Working of Tin in Cornwall,' by Dr. Merrest, *Philosoph. Trans.* xii, 949; J. Childrey, *Britannia*, 8; Worth, *Historical Notes Concerning the Progress of Mining Skill*, 15.

² The increased price of materials, added to the expense of drainage, brought about a period of great depression throughout the tin mines (S. P. Dom. Chas. I, cccxxii, 1).

³ Worth, *Historical Notes Concerning the Progress of Mining Skill*, 28.

⁴ 'Notes on the Remains of Early British Tin Works,' by Robt. Hunt, *Gent. Mag.* xiii, 696.

⁵ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 48. See also 'An Indenture and Ordinance respecting the Working of Silver Mines in Devon and Cornwall,' by E. Smirke, *Arch. Journ.* xxvii, 37.

⁶ Worth, *Historical Notes Concerning the Progress of Mining Skill*, 30.

⁷ 'An Indenture and Ordinance respecting the Working of Silver Mines in Devon and Cornwall,' by E. Smirke, *Arch. Journ.* xxvii, 133; Del Mar, *History of the Precious Metals*, 63, 72.

⁸ Worth, *Historical Notes Concerning the Progress of Mining Skill*, 30.

⁹ Cf. G. Agricola, *De Re Metallica*, (ed. 1536), p. 131 et seq.

¹⁰ Pryce, *Mineralogia Cornubiensis*, 150.

¹¹ Polwhele has found the remains of one at the end of a prehistoric tinwork in the Scilly Isles (*Hist. of Cornw.* bk. ii, 10, note).

¹² Convoc. Cornw. 12 Chas. I, c. 28, 31.

¹³ Carew, *Surv. of Cornw.*

¹⁴ Convoc. Cornw. 1687, c. 5. Cf. Pryce, *Mineralogia Cornubiensis*, 141; Polwhele (*Hist. of Cornw.* bk. iv, 136) makes it a century earlier.

¹⁵ 'Mineral Observations on the Mines of Cornwall and Devon,' *Philosoph. Trans.* vi, 2107. Cf. Geo. Sinclair, *Hydrostaticks*, 298; John Houghton, *Collections for the Improvement of Husbandry and Trade*, 21 April, 1693; Galloway, *Annals of Coal Mining and the Coal Trade*, 71-74, 157-159.

¹⁶ *Report on the Stannary Act Amendment Bill* (1887), Q. 291.

¹⁷ Carew, *Surv. of Cornw.* (ed. 1811), p. 11. Worth, *Historical Notes on the Progress of Mining Skill*, 27. 'Mineral Observations on the Mines of Cornwall and Devon,' *Philosoph. Trans.* vi, 2104.

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lowered them ; later came the horse-whim,¹ and perhaps the water-wheel as well, just as we have seen to have been the case with drainage.

In some tin mines also similar devices served for the descent and ascent of the workmen. No difficulty would be likely to arise with regard to this matter as long as the works were shallow stream-tin affairs. In shammel workings, too, the shammels or terraces themselves furnished a means for men to go up and down. Lode works, however, required the adoption of special facilities. In Carew's day the workmen were let up and down in a stirrup operated by two men who turned a windlass at the top,² for a long time the only system in use besides ladders, but employable only in perpendicular shafts. Ladders in the small single-shaft concerns of early times would have taken up too much space,³ but when levels and winzes became developed, they grew to be indispensable, and in time all but universal.⁴ Among the chief advantages which their use entailed was the economizing of lifting power and the avoidance of the mechanical difficulties of stopping cages or buckets at the entrance of different levels ; but it must be added that the use of ladders as the shafts deepened brought with it a terrible increase in the miners' toil, although it was not until the eighteenth century that this drawback became very apparent.

The ventilation of tin works was probably not a pressing question until the sixteenth or seventeenth century, when galleries began to be driven far and shafts extended in depth.⁵ The old lode workers were much troubled by foul air, and went as far only from the shaft as the air would yield them breath. When it failed they sank another shaft, and as time went on this practice led to the establishment at regular intervals of air-shafts in the mines, leading up to the surface. With a few trifling exceptions, such as, perhaps, the use of large ventilating bellows at St. Agnes in 1696,⁶ after the manner in which Bushell had purified his Cardigan mines some fifty years before,⁷ these few words sum up the subject of mine ventilation in the stannaries until a comparatively modern date.⁸

The primitive nature of early Cornish mining

¹ Cf. Galloway, *Annals of Coal Mining and the Coal Trade*, 74, 168. Pettus, *Fleta Minor*, 307.

² Carew, *Surv. of Cornw.* (ed. 1811), 36.

³ Cf. Galloway, *Annals of Coal Mining and the Coal Trade*, 185. *Philosoph. Trans.* iii, 770.

⁴ Worth, *Historical Notes on the Progress of Mining Skill*, 26.

⁵ Carew (*Surv. of Cornw.* ed. 1811, 37) speaks of 'unsavourie damp which here and there distemper their heads.'

⁶ Worth, *Historical Notes on the Progress of Mining Skill*, 33.

⁷ Bushell, *Tracts on Mines*, 'The Case of Thomas Bushell truly Stated.'

⁸ Cf. Childrey, *Britannia*, 8.

is shown by a list of the tools of the ancient 'streamer,'⁹ which consisted simply of a pick and shovel, with perhaps a bowl for bailing.¹⁰ A working tinner of the Middle Ages was one of the poorest of men, and his poverty was so well recognized that it became proverbial, and was handed down in such local sayings as 'A tinner has nothing to lose,' 'A tinner is never broke until his neck's broke.' Discoveries in old stream works¹¹ show that as late as the sixteenth century wooden implements were not uncommon, although in Carew's time the pick was usually of iron and the shovel iron-shod.¹²

In the lode works, before the invention of blasting, the sole additional tools were gads and wedges to split the rocks, the miner's pick being flat at one end to serve as a hammer. A few stone hammers have been found in Cornwall. In most other mining districts they abound, but in tin streaming they were not needed, and in lode-mining the poll-pick answered all purposes until the utilization of gunpowder for blasting, when hammers were required to beat the drills. Until then rock-splitting was done by wedges. Into holes bored in the same way as at present, except that the bit ended in a quadrangular point instead of in a single edge, were put two semi-cylindrical rods of iron or steel, called 'feathers,' of the same length as the hole itself. A steel wedge was then driven between them, and the rock broken off piecemeal. Sometimes also wooden wedges were driven into clefts, and then soaked with water to cause the wood to swell. When the ground was more than usually hard the miners wore away the face of the rock in the same manner as that in which masons cut stone for building.¹³

From the work of actual excavation let us turn to the treatment which the ore received upon the surface. The process spoken of as smelting comprises two distinct operations—the preparation of the ore, and its conversion into white tin.

⁹ For those used in a mediaeval Devonshire silver mine, see 'An Indenture and Ordinance respecting the Working of Silver Mines in Devon and Cornwall,' by E. Smirke, *Arch. Journ.* xxvii, 314–322. Cf. also Galloway, *Annals of Coal Mining and the Coal Trade*, 53.

¹⁰ 'The Antiquity of Mining in the West of England,' by R. N. Worth, *Journ. Plymouth Inst.* v, 127.

¹¹ Harl. MS. 6380, fol. 1. Carew, *Surv. of Cornw.* 8.

¹² These shovels were rude but elaborate. The handle was stuck slantingwise into a hole in the face, or, in the case of another specimen, in the Truro Museum, the entire shovel was of one piece, and shaped like a huge wooden spoon ('The Antiquity of Mining in the West of England,' by R. N. Worth, *Journ. Plymouth Inst.* v, 121).

¹³ 'The State of the Tin Mines at Different Periods,' by John Hawkins, *Trans. Roy. Geol. Soc. Cornw.* iv, 85. Fire was used in the Mendip mines to break the rocks (*Philosoph. Trans.* iii, 769), and also, at an early period, in Derbyshire (Houghton, *The Compleat Miner*, 20, art. xl).

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In the infancy of mining only the massive and productive pieces were dealt with before melting. The richest stones were smelted in the block, and the metal disengaged by the direct action of heat. The poorer were subsequently pounded with rocks, and washed. The first improvement upon this method was the working of these stones in something of the fashion of a mortar and pestle. Next came the use of mills to reduce the ore to a still finer state of pulverization. In Loe Pool Valley are still to be seen boulders of hard elvan, with surface indented into deep hollows where the tin stone was battered, preparatory to its reduction in the furnace,¹ and Polwhele has left an account of an ancient mill discovered in the Scilly Isles,² as well as that of the remains of an old 'buddle,' or washing place.³

Smelting at its inception was carried on by the miners themselves. A small pit was dug, and a fire kindled in it, close to where the ore was found. Upon this the stones were thrown, and the metal afterwards gathered from among the ashes and sand.⁴ Several antiquarian discoveries in Cornwall have led Pryce to the conclusion that this was the form of operation prevailing at the time the Phoenicians visited Britain.⁵ By the time of Diodorus Siculus, however, an advance had been made. The astragalus block, which figures so prominently in his account, must have been the product of a furnace from which the flow of metal could be directed. Of such there are many remains, varying in character, but passing under the common name of 'Jews' Houses.' Some were built into the shape of inverted cones of hard clay,⁶ about three feet broad at the top, and three feet deep. A blast of air, conveyed by common bellows to the lower part of the furnace, served to create an intense heat, and the molten tin was discharged from an opening at the foot.

Another fairly advanced but probably exceptional smelting furnace has been discovered in the Land's End district, near St. Michael's Mount—namely, a bronze cauldron, resting upon a layer of charcoal. This specimen has been held to be a Phoenician vessel introduced into the mining districts in the days before Strabo.⁷

Still another early type of smelting furnace

was of granite, and dome-shaped, and with it have usually been associated the granite moulds, of which many have been discovered on Dartmoor,⁸ and other stream-tin fields.⁹

No written records exist for the course of smelting operations until we reach the year 1198.¹⁰ De Wrotham's letter of that date informs us that there were two smeltings, the first apparently a rude process, taking place near the mine itself; while the second could not be done except at certain towns designated by the warden, the reason being the connexion of the smelting with stannary taxation. From other sources we learn a few details concerning the preliminary treatment of the ore. Twenty years ago there existed at Retallack Farm, Cornwall, the remains of a mediaeval 'crazing-mill,' in which the tin stones were reduced to sand before being treated with fire. The house measured 20 ft. by 13 ft., and in the gable wall was a rectangular opening, 2 ft. square, where passed the axle of the water-wheel. Within and without were granite millstones, three or four feet in diameter, grooved on the face in a circular direction. In the vicinity were also found stones with basin-shaped hollows, similar to many found in different parts of Cornwall and Devon, and probably used for pounding the ore; and one stone, a rough granite block 4 ft. in length by 14 in. in breadth and depth, which showed, by the regularity of the hollows worn in it, that the pounders were probably worked by machinery, like the present-day stamps. Other stones were found, apparently used for pulverizing the sand by hand; and also a rough stone buddle, about two feet in diameter.¹¹

With the advent of improved methods of smelting it became no longer necessary to fuse the tin twice to obtain a proper fineness, and from the first and second smeltings instanced by De Wrotham arose the single blowing-house process known to Beare and to Carew. To set even an approximate date for its introduction is impossible; but it seems to have been in common use by the middle of the fourteenth century, as we find the Black Prince sharing in the profits of several at Lostwithiel in 1359.¹² In 1426 occurs the case of John Aunger of Cornwall, 'husbandman and blower';¹³ and in 1495 the

¹ Worth, *Historical Notes concerning the Progress of Mining Skill*, 35.

² Polwhele, *History of Cornwall*, i, Supplement, 64.

³ Ibid. 65.

⁴ Pryce, *Mineralogia Cornubiensis*, 281. Louis, *The Production of Tin*, 6. 'Notes on an Ancient Smelting-place for Tin,' by Le Grice, *Trans. Roy. Geol. Soc. Cornw.* vi, 43.

⁵ Pryce, *Mineralogia Cornubiensis*, 281.

⁶ 'Notes on an Ancient Smelting-place for Tin,' by Le Grice, *Trans. Roy. Geol. Soc. Cornw.* vi, 44, 45.

⁷ 'On the Fragments of a Bronze Furnace discovered near St. Michael's Mount,' by R. Edmonds, *Proc. Penzance Nat. Hist. and Ant. Soc.* i-ii, 347.

⁸ Bate, 'Historical Antiquities of Dartmoor,' *Rep. Roy. Cornw. Polytechnic Soc.* 1872, 149.

⁹ *Gent. Mag.* lxi, 34. Some time ago, in East Cornwall was unearthed an entire mining village, containing three of these granite furnaces, in various stages of preservation; while scattered about were pieces of slag, and occasionally of metallic tin ('Notes on Some Antiquities in East Cornwall,' by R. N. Worth, *Journ. Roy. Inst. Cornw.* iv, 75, 76).

¹⁰ Black Book of the Exchequer, No. 10.

¹¹ 'An Ancient Crazing Mill,' by James Bryant, *Journ. Roy. Inst. Cornw.* vii, 213-214.

¹² White Book of Cornw. 32 Edw. III, c. 89 d.

¹³ *Cal. of Pat.* 1426, 308.

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new ordinances put in force by Prince Arthur dealt among other subjects with the entering of blowing-house marks and the swearing in of blowers.¹ The buddle and the crazing-mill, it is safe to say, figured also during this period anterior to the reduction of the ore. The molten metal was cast into slabs and blocks of from 200 to 300 pounds each in weight.²

During the first half of the sixteenth century many notable improvements were introduced into the Cornish mines from the continent. The English kings at an early period had been impressed with the superior skill of the Germans in mining and metallurgy, and repeated entries are to be found in mediaeval state documents of mineral concessions made to foreign workmen to induce them to immigrate.³ It may have been the royal patronage given these foreigners, and the report of their great skill, which induced Sir Francis Godolphin, a large tin producer, to send for the person mentioned by Carew as 'a Dutch mineral man,' by whose aid were effected all those important improvements which he notes in the management of the great Godolphin tin works.⁴ These were probably the use of the hydraulic stamp, already considerably employed in the German mines,⁵ various improvements in the dressing of tin ore, and possibly the use of charcoal for smelting instead of peat, which is mentioned as the usual fuel in all stannary grants of privilege.⁶

The first detailed account of tin dressing is given by Carew. The ore was broken small with hammers,⁷ and then carried in carts, or on horses, to a stamp-mill of three, and sometimes six, iron-shod heads, driven by a water-wheel. Previously the practice had been to stamp the tin while dry, but wet stamps had by this time come into use, with the result that only the roughest part of the ore now had to go from stamp to crazing-mill,⁸ whereas under the dry method all must go. The next operation was completely distinctive, and no longer has a parallel in Cornwall. The water, after it had left the mill, was made to descend a series of stages, at each of which it fell upon 'green turfe,' three or four feet square, and one foot thick.⁹

¹ Add. MS. 6713, fols. 101-104.

² Exch. K. R. Tin Coinage Rolls.

³ 'The Germans in the Stannaries,' by J. B. Cornish, *Journ. Roy. Inst. Cornw.* xiii, pt. 4, 430-434. Atkinson, *The Discoverie and Historie of the Gold Mynes of Scotland*, 18-20, 33. Watson, *Compendium of British Mining*, 58. Calvert, *Gold Rocks of Great Britain and Ireland*, 52, 87, 98, 103, 109, 130, 131, 139, 144. S. P. Dom. Eliz. clxvii, 24; clxix, 16.

⁴ Carew, *Survey of Cornwall* (ed. 1811), 42.

⁵ Reyer, *Zinn*, 81.

⁶ Chart. R. 36 Hen. III, m. 18; 33 Edw. I, m. 40, 41.

⁷ Carew, *Survey of Cornwall* (ed. 1811), 39.

⁸ Ibid. 39, 40.

⁹ Ibid. 40. See also Harl. MS. 6380, f. 106.

Here the sandy ore was laid, and gently tossed to and fro, so that the lighter particles of waste might wash away, and the tin remain entangled in the fibres. Finally the ore was washed 'in a wooden dish, flat and round, being 2 feet over, and having two handles fastened at the sides, by which they softly shogge the same to and fro in the water between their legges, as they sit over it, until whatever of the earthie substance that was yet left be flitted away.'¹⁰ 'Some, of later times,' says Carew, evidently referring to the present practice of buddling, 'with a slighter invention, and lighter labour, doe cause certain boyes to stir it up and downe with their feete, which worketh the same effect.'¹¹

The blowing-house, at which the smelting of the ore finally took place, was a rude structure, probably of rock and turf, with a thatched roof; the whole being so inexpensive that every few years it was burned down in order to save the particles of tin which the blast had driven up into the thatch.¹² Here the prepared ore was made into parcels, according to its quality,¹³ and then smelted on the hearth of the granite furnace by a charcoal fire fed by a blast from a large pair of bellows worked by a water-wheel. Abundant evidence exists that the white tin produced in this fashion was as pure in quality as that produced by the smelters of to-day.¹⁴

The slight accounts of tinning given by Norden¹⁵ and Childrey¹⁶ substantiate Carew's evidence in most details, and bring our account down to the year 1660, at about which date we may say that the modern period of tin mining begins, as opposed to that of the Middle Ages. In the course of the next few years began a régime of improvements both in mining and in smelting, which, closely following the great impetus given the mines during the Commonwealth by the abolition of the coinage, sent up the production to 2,141 thousand-weight in 1673,¹⁷ 3,133 thousand-weight in 1683,¹⁸ 4,800 thousand-weight in 1710,¹⁹ and by slow advances to nearly double the latter figure in 1837,²⁰ the year in which the stannary system was remodelled.

The first manifestation of this movement seems to have been a series of improvements in the dressing and smelting. According to the anonymous writer already quoted, the ore dressing by 1671 was done chiefly by boys. After

¹⁰ Carew, *Survey of Cornwall* (ed. 1811), 40.

¹¹ Ibid. Buddles, moreover, had already been mentioned in an Act of Henry VIII, to restrain tanners from filling harbours with their silt (Stat. 23 Hen. VIII, c. 8).

¹² Fuller, *History of the Worthies of England* (ed. 1662), 195.

¹³ Harl. MS. 6380, fol. 107.

¹⁴ *Cornish Mining*, 13.

¹⁵ Norden, *Speculi Britanniae Pars* (Cornwall), 13.

¹⁶ Childrey, *Britannia*, 10.

¹⁷ Receiver's View, 1673.

¹⁸ Ibid. 1683.

¹⁹ Ibid. 1710.

²⁰ Hunt, *British Mining*, 887.

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the stones had been broken to convenient size, they were carried to a stamping-mill, whose mechanism by this time had become so improved that it would work for a couple of hours without attention,¹ one John Tones, when a boy thirty years before, having patented an invention by means of which, when there was not enough ore in the coffer, the water was turned off, whereas before this a bell had been used which only gave warning when the coffer was empty, by which time the mill was often broken.² One wheel could now work the stamps in three or four coffers. Leaving the stamp heads, the ore was subjected to a series of operations, the object of which was to grade and concentrate it by application of running water. From the stamps it was washed through a grate into a 'launder,' or shallow trench, where it was divided into 'forehead,' 'middle,' and 'tails,' according to its specific gravity. After having been 'trambled' or buddled, it was 'sezed,' 'dilleughed,' crazed or 'framed,' as required.

The buddle is described as a long square tye of boards or slate about 1 foot deep, 6 feet long, and 3 feet broad, wherein stood a man barefooted, who, with a 'trampling shovel,' cast up ore upon the buddle head as high as his middle.³ The stuff was worked both with the shovel and with the feet, and, as the buddle was traversed by a gentle flow of water, the effect of the operation was to separate the ore into several qualities, the heaviest remaining at the head, and the lightest being deposited at the foot.⁴ There also were 'drawing buddles' for 'retrambing,' which had no tye, but a plain, sloping board.⁴ Seizing consisted in the use of a hair sieve, instead of the drawing-buddle, to grade the tin.⁴ Dilleughing was performed by putting the 'forehead' of the doubly-trambled tin into a canvas sieve, and shaking it in a large tub of water. The tails from the buddle were thrown into strakes, or tyes, of which there were commonly three or four in succession, where the 'slimes,' or finer ores, were separated from the coarser 'roughs.'⁴ The latter were crazed and retrambled,⁵ the former were framed,⁵ the frame being a rack 6 feet long by 3½ feet broad, suspended on two pivots like a cradle.

In this account we find mention, for the first time, of the process known as calcining, to burn away the impurities of the ore. It was done in a square kiln, heated by furze,⁶ the ore being spread over a flat granite slab, placed above the furnace, over which the flame played. Having been stirred on the slab with a rake,⁷ the ore was finally pushed into the fire, the fire-

place, when choked up, emptied, and the mixture of ore and ashes retrambled. Rude as many of these operations were, they show a great advance in mining skill since the time of Carew.

Dr. Merrest, a few years later, describes the tin stuff as dried in a furnace on an iron plate⁸ before being crazed, which seems an inexact reference to calcining. He says, also, that stuff not worth working was thrown into heaps which, in six or seven years, would be fit for reworking. The germ of truth in this statement, undoubtedly made in all honesty, seems to be that, just at that date, advances in dressing were unusually rapid, and every few years operations became more precise.

Improvements had also been made in smelting. The slovenly habit of burning the blowing-house to catch the tin in the thatch, which Fuller mentions in 1662, had been replaced by the construction of chambers in the chimneys for the deposit of metallic dust.⁹ Although smelting with pit coal was still unknown, a difference had been made in the fuels used for various grades of ore. Moor, or stream tin was fused by charred peat; lode tin by charcoal and peat mixed; and slag by charcoal alone.¹⁰

Following closely upon this advance in ore-dressing came the invention of improved devices for mine drainage. As the tin districts of Cornwall became further developed, mining had taken on more of the character of lode-mining. The stream works were still largely in evidence in 1765,¹¹ but in 1778 Pryce gives us to understand that they were of minor importance. Few changes had taken place in their operations since the days of Carew. The adventurer sank a hatch, three or five fathoms, to the shelf on which the tin stones were deposited. When he had found, by a rough washing on the point of a shovel, that it was 'paying' tin, he drained his work by a level, and continued working with the aid of a few helpers until the spot was exhausted.¹²

In lode mines the accumulation of water called for more advanced methods. At the beginning of the eighteenth century John Coster had taught the Cornish miners to use one large water-wheel, 40 feet in diameter, instead of the half-dozen smaller ones then used for a single mine.¹³ His invention, however, was overshadowed by that

¹ 'Mineral Observations on the Mines of Cornw. and Devon,' *Philosoph. Trans.* vi, 2108.

² Ibid. 2108-2109.

³ Ibid. 2109.

⁴ Ibid. 2110.

⁵ Ibid.

⁶ Ibid. 2111.

⁷ Ibid. 2112.

⁸ 'The Relations of Tin Mines and the Working of Tin in Cornwall,' by Dr. Merrest, *Philosoph. Trans.* xii, 952.

⁹ Worth, *Historical Notes on the Progress of Mining Skill*, 50.

¹⁰ 'Mineral Observations on the Mines of Cornw. and Devon,' *Philosoph. Trans.* vi, 2113.

¹¹ Jars, *Voyages Métallurgiques*, iii, 187.

¹² Pryce, *Mineralogia Cornubiensis*, 132-133.

¹³ Ibid. 307.

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of the steam-engine. It is not clear when or at what place the latter first appeared in Cornwall. Pryce dates its introduction at about the year 1708.¹ Carne declares that the first was at work at Wheal Vor from 1710 to 1714.² Redding, on the other hand, says that the earliest was erected in 1725 at Wheal Rose.³ It was still believed that water could be raised only 32 feet, and at first the new invention took the form of a series of steam suction pumps which, in mines of any depth, were so multiplied that the first outlay and subsequent cost were enormous. The scale on which Cornish mines were operated, and the increasing amount of work thrown upon the engine, soon rendered it imperative that some forcing arrangement be adopted. Morland had patented the plunger in 1675,⁴ but its development was slow, and the first note we have of its adoption in any mine is in 1796, in the United Mines, Gwennap.⁵

Meanwhile, Savery's engine of 1696 had been superseded by Newcomen's in 1705, yet so conservative were the tanners that in 1742 only one steam-engine was to be found in the whole county.⁶ Then came a rapid advance, and in the next 36 years more than sixty were erected, and more than half had been rebuilt and enlarged.⁷ Newcomen's engine, effective as it was in comparison with previous efforts, was completely displaced in the latter years of the eighteenth century by that of Boulton and Watt. Their first engine in Cornwall was erected in 1777⁸ at Chacewater. In five years' time twenty-one had been set up, and only one of Newcomen's remained, that, too, disappearing in 1790.⁹ Further improvements at the hands of Trevithick, Hornblower, and Woolf brought the Cornish mine-engine to a high state of efficiency in the early decades of the nineteenth century,⁹ while the practice of draining the surface of the mines, and the greater attention given to the tightness of the adits and pit work, lessened materially the work required of the engines.¹⁰

The result of these improvements was a rapid increase in the depths at which tin could be

mined. From 1720 to 1778, 90 fathoms represented the maximum depth as attained by the aid of the Newcomen engine; but the advent of Watt's improved machines is marked by a sudden increase of this maximum to about 200 fathoms in the years approximately from 1778 to 1812. During the following quarter-century 200 was reached,¹¹ and the progress during the remainder of the century was correspondingly rapid. The Dolcoath Mine, in 1900, had reached a depth of 470 fathoms below adit,¹² and several other Cornish works were little less extensive.¹³

Nearly contemporaneous with the great advances in ore-dressing and mine-drainage appears an almost equally important improvement in the apparatus for mining itself. A description of an ordinary tin miner's tools is given in *Philosophical Transactions* in 1671, showing that, with the exception of tamping-iron and borer, they were practically the same as to-day. A beele, or Cornish tubber, was used, with double points, 8 or 10 pounds in weight, and well steeled. With care it might last six months, but had to be new-pointed every fortnight. A sledge weighed from 10 to 20 pounds, and should last 7 years. Gads, or wedges, were of 2 pounds weight with steel points. They lasted for about a week, but required sharpening every two or three days.¹⁴ These and the ubiquitous shovel and barrow constituted the tinner's kit.

The drilling and splitting of the lode were rendered obsolete by the introduction of blasting. It seems to have been introduced in Hungary or Germany in about the year 1620, but England did not take it up until 1670, when we find it introduced into the copper mines at Ecton, Staffordshire, by German miners brought in by Prince Rupert.¹⁵ From there it spread into Somerset in 1684,¹⁶ and soon afterwards entered Cornwall, where it seems to have been employed at St. Agnes in the beginning of the eighteenth century.¹⁶ After that its universal adoption was simply a matter of time.

For more than a century blasting was carried on in Cornwall in a dangerous way.¹⁷ After the

¹ Pryce, *Mineralogia Cornubiensis*, 153.

² 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 50.

³ *Yesterday and To-Day*, i, 128.

⁴ A similar kind of pump was known to the ancients, but had lacked the most important part of Morland's invention, the stuffing-box.

⁵ 'Cornish Mine Drainage,' by Mitchell and Letchies, *Rep. Roy. Cornw. Polytechnic Soc.* 1874, 135.

⁶ Worth, *Historical Notes concerning the Progress of Mining Skill*, 22.

⁷ Pryce, *Mineralogia Cornubiensis*, xiv.

⁸ *Ibid.* 313.

⁹ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 52, 53, 56. Worth, *Historical Notes concerning the Progress of Mining Skill*, 23.

¹⁰ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 66.

¹¹ Worth, *Historical Notes concerning the Progress of Mining Skill*, 24.

¹² *Records of the London and West Country Chamber of Mines*, vol. i. pt. i, 16.

¹³ *Ibid.* 18.

¹⁴ 'Mineral Observations on the Mines of Cornwall and Devon,' *Philosoph. Trans.* vi, 2104.

¹⁵ 'State of the Tin Mines at Different Periods,' by J. Hawkins, *Trans. Roy. Geol. Soc. Cornw.* iv, 84. 'History of Mining in Cornwall and Devon,' by John Taylor, *Tilloch's Philosoph. Magazine*, v, 357. Gallo-way, *Annals of Coal Mining and the Coal Trade*, 226, 227.

¹⁶ Worth, *Historical Notes concerning the Progress of Mining Skill*, 17; 'State of the Tin Mines at Different Periods,' by J. Hawkins, *Trans. Roy. Geol. Soc. Cornw.* iv, 86.

¹⁷ *Trans. Roy. Geol. Soc. Cornw.* i, 78, et seq.; Worth, *Historical Notes concerning the Progress of Mining Skill*, 18.

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powder had been introduced and tamped an iron rod called the 'needle' was driven through the tamping, and in this aperture was placed a hollow rush filled with powder to act as fuse. Sometimes quills were used, in which case the tamping was put around them and the needle not inserted. The iron needle and tamping-bar were the cause of many casualties, but it was not until within the nineteenth century that the safety fuse, and safety tamping-bar, shod with copper, were suggested, and even then it required some time for them to enter into general use.¹ In recent decades the use of dynamite or gun-cotton has driven out that of gunpowder in open workings or wide levels. Rock-borers worked by compressed air have likewise made considerable headway in the larger tin mines,² but the primitive methods of the pick and drill are still far from being completely displaced.

Contemporaneous with the introduction of the steam-engine, but more rapid in its developments, came the reduction of the ore by the use of pit coal. This problem (and the growing scarcity of wood fuel made it a serious one) had long been a favourite hobby of inventors. As early as 1632 Dr. Jorden had asserted its practicability,³ and had tried, unsuccessfully, to solve it.⁴ At about the same period a similar attempt was made by Sir Bevil Grenville,⁵ but this also failing, the matter seems to have dropped from public notice. Meanwhile, with the decadence of the steam works came an added impulse toward the supersession of the still primitive charcoal blast. The alluvial ore, occurring in rounded masses and grains in a high state of purity, was especially adapted to this method. The charcoal ashes formed the necessary flux, while the fuel contained no elements capable of injuring the metal. Lode ore was somewhat more refractory, and this fact, added to that of the scarcity of charcoal, resulted in a series of fresh attempts to utilize the cheaper fuel.

The invention of the process has usually been ascribed to Beccher, a German chemist residing in Cornwall in the latter years of the seventeenth century,⁶ but little, if any, use was made of it for some years, and Beccher's claims, depending merely on his own assertion in the preface to one of his works,⁷ are possibly open to question. It was not until 1705 that a Mr. Liddell obtained a patent for smelting black tin with fossil coal in

iron furnaces.⁸ Close upon this patent came the invention of the reverberatory furnace of masonry, in which the finely divided ore could be smelted easily, and at the same time direct contact with the fuel be avoided.⁹ This was the origin of the so-called Cornish method of tin-smelting. The ore, mixed with finely crushed anthracite or culm was charged upon the bed of the furnace and heated until reduction was complete. The less fusible and pasty slag was then drawn from the furnace, while the completely melted portion, or 'glass,' was tapped out with the liquid metal. The former was then removed and the metal purified.¹⁰ Pryce described this method in 1778, and in all essential points it was the same as now, except that his furnace charge was but five or six hundredweight of ore, while nowadays a two or three ton charge is preferred.¹¹

The first reverberatory furnace is said by tradition to have been set up at Treloweth, although, according to another statement, it was established in 1706 at Newham by Monatt, a German, and after a few years transferred to Calenick.¹² Many years were still to elapse before the blowing-house was superseded. Charcoal tin being of a slightly superior grade fetched a higher price,¹³ and as long as sufficient stream tin could be found to charge them, blast furnaces still persisted. In 1765 Jars found both methods used side by side.¹⁴ Pryce's testimony in 1778 is to the same effect,¹⁵ and it was not until about sixty years ago that the last blowing-house at St. Austell was finally discontinued.¹⁶

The successive developments in the industry which set it upon a modern footing, namely, improvements in ore-dressing, drainage by the steam-engine, the introduction of blasting, and smelting with pit coal, need not blind us to smaller improvements. First we have to note an almost continuous series of improvements in ore-dressing, continuing from the first spurt in the seventeenth century down to the present. Hardly had the eighteenth century begun when the crazing-mill fell into disuse¹⁷ owing to improvements in stamping and dressing, which rendered it unnecessary. The former process between 1671 and 1778 had undergone great

⁸ Pryce, *Mineralogia Cornubiensis*, 282.

⁹ Louis, *Production of Tin*, 8.

¹⁰ Ibid.

¹¹ Ibid. 9; *Cornish Mining*, 9.

¹² Worth, *Historical Notes concerning the Progress of Mining Skill*, 50.

¹³ Borlase, *Natural Hist. of Cornwall*, 182.

¹⁴ Jars, *Voyages Métallurgiques*, iii, 212-213.

¹⁵ He tells us that the blowing-houses smelted from eight to twelve hundredweight of tin in twelve hours, by the use of from eighteen to twenty-four sixty-gallon pecks of charcoal (*Mineralogia Cornubiensis*, 136).

¹⁶ *Cornish Mining*, 13-15; Worth, *Historical Notes concerning the Progress of Mining Skill*, 51.

¹⁷ *Journ. Roy. Inst. Cornw.* i, 179.

¹ Worth, *Historical Notes concerning the Progress of Mining Skill*, 18.

² Ibid. 19, 20. Hunt, *British Mining*, 507-528, 537-539, 561.

³ Jorden, *Discourse of Natural Baths*, 50.

⁴ Galloway, *Annals of Coal Mining and the Coal Trade*, 215.

⁵ Pryce, *Mineralogia Cornubiensis*, p. 282.

⁶ For an account of his life see 'The State of the Tin Mines at Different Periods,' by J. Hawkins, *Trans. Roy. Geol. Soc. Cornw.* iv, 87-91.

⁷ *Alphabetum Minerale* (ed. 1682).

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changes, the stamps becoming six times as effective as they had been before. The lifters were of ash, and their iron heads weighed 140 pounds.¹ Pryce's description also seems to show that all the heads in a coffer operated upon the tin in succession, the blow of the first sending it to the second, and that of the second to the third, after which it was permitted to emerge.²

We find buddling,³ sezing,⁴ dilleughing, and framing⁵ practised as before, but with greater delicacy of manipulation.⁶ 'Trunking' also had been introduced,⁷ for the stamped tin stuff which ran from the coffer to the two farther pits. At the semicircular head of the trunk (a pit much like the buddle) a boy stirred these slimes with a small shovel so that the water which ran in might wash both filth and tin over a cross-board about 10 inches deep, from which it passed into the body of the trunk. What remained at the head was framed, and the residue trunked again, and then framed also. The calciners, formerly of moor-stone, were now built of brick,⁸ and the burnt leavings, which until 1735 had been thrown away as useless, were after that date reduced to metal.⁹

The great work of the nineteenth century has been the provision of more precise and efficient arrangements for dressing, chiefly by the substitution of automatic mechanism for human labour, the motive power in almost every case being derived from steam.¹⁰ The stamps, for example, are worked almost entirely by steam, and are heavier and more numerous, running in many cases to forty-eight in a set.¹¹ Among other improvements have been the crushing mill, the stone breaker, the sizing trommel, the classifier, the continuous jigger,¹² the round buddle, the automatic frame, and the self-acting calciner. The crushing mill was introduced shortly after 1806, by Mr. John Taylor, and from that time to this has formed the chief apparatus for redu-

cing ores for the jigger, buddle, and other concentrating apparatus.¹³ Framing has been so far improved that one hundred frames can now be managed by a girl and a boy.¹⁴ Trunking by machinery was introduced at St. Ives in about the year 1825. The buddle, formerly a shallow oblong trench, is now a circular concave or convex frame revolving slowly beneath a jet of water, centrifugal force classifying the ores according to their weight.

In mining itself more scientific methods of prospecting came into vogue during the eighteenth century. Costeaning and shoding,¹⁵ although now abandoned,¹⁶ were still practised in the days of Pryce, but already they had been supplemented by boring,¹⁷ and by a better knowledge of geology. Our ancestors were satisfied to pursue a single vein without suspecting that others might exist near at hand, or if aware of their existence they were apt from want of capital or disinclination to invest it, or perhaps from want of a greater spirit of enterprise to leave them unexplored. At present the lodes are more speedily and fully searched by the practice of driving across the country from north to south, and vice versa, as well as by other methods too technical to be here described.

Ventilation, in the eighteenth century, was extended by the provision of boarded channels in the bottoms of adits, by which streams of pure air were carried into the mine.¹⁸ Another method was that of a stream of water passing into one of the shafts, the accompanying air being carried by a pipe placed close to the discharge of the water to the extreme end of the level where required.¹⁹ This process, still used in 1860, was sometimes assisted by small fans worked by boys.²⁰ Other apparatus have been suggested from time to time,²¹ but none have proved especially effective, and the ventilation of the tin mines is largely natural, the air finding its way in by certain channels, and out by others.²² Save where a drift is very long the air is fairly good. Improved ventilation brought increased health to the labourer, and added efficiency to his work.

¹ Worth, *Historical Notes concerning the Progress of Mining Skill*, 39.

² Pryce, *Mineralogia Cornubiensis*, 221.

³ Add MS. 6682, fol. 294-295.

⁴ Ibid. fol. 295.

⁵ Ibid. fol. 296.

⁶ Pryce, *Mineralogia Cornubiensis*, 133-135.

⁷ Worth, *Historical Notes concerning the Progress of Mining Skill*, 39.

⁸ Pryce, *Mineralogia Cornubiensis*, 224.

⁹ Ibid. 230.

¹⁰ Worth, *Historical Notes concerning the Progress of Mining Skill*, 40-41.

¹¹ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 61-62. The first steam stamp was at Wheal Vor in 1812 (Hunt, *British Mining*, p. 725).

¹² The first jiggering machine erected in Cornwall was introduced by Richard Taylor at the Consolidated Mines, Gwennap, in 1831, and the first continuous jigger was patented in 1843 (Hunt, *British Mining*, 694-695. See also *Proc. of Mining Inst. Cornw.* i, No. 3, pp. 34-53).

¹³ Hunt, *British Mining*, p. 693.

¹⁴ Worth, *Historical Notes concerning the Progress of Mining Skill*, 40-41.

¹⁵ Ray, *A Collection of English Words*, 131.

¹⁶ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 74-75.

¹⁷ Add. MS. 6682, fol. 281.

¹⁸ Pryce, *Mineralogia Cornubiensis*, 146-147.

¹⁹ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 64. There does not seem to have been any application of the method of purifying the air by fire, such as took place in the coal mines at this time (Galloway, *Annals of Coal Mining and the Coal Trade*, 326-327, 253-254).

²⁰ Worth, *Historical Notes concerning the Progress of Mining Skill*, 32.

²¹ Ibid. 33.

²² *Report on Stannary Act Amendment Bill* (1887), Q. 366.

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In 1586 and 1602 four hours in the twenty-four was the longest time during which a tinner could remain at work,¹ but by Pryce's time it had become possible to extend this to six hours,² and, fifty years afterwards, to eight.³ Another result of the better ventilation was that instead of being forced to sink air shafts at a distance of about 30 fathoms from one another, the miners, by the end of the first quarter of the nineteenth century, could proceed 100 fathoms from a shaft without feeling discomfort.⁴

The old-fashioned methods of descent into the mines by means of long ladders, so injurious to the health of the men, have, within the last century, been superseded in the larger mines by the use of the man-engine, which was first introduced in 1842.⁵ The expense of this arrangement, however, has proved too great to allow of its use in all works, and even where in operation the plan of the Cornish tin mines is usually so irregular that the use of ladders can be only partially superseded. In other mines is used the wire rope and cage method of descent so well known in the collieries.⁶

Some time after the improvements in drainage came the introduction of the steam-engine for drawing ore and rubbish from the mine, a work previously done by application of horse power. A saving of 50 per cent. hastened its adoption, especially in view of the fact that a modern mine of any depth could not employ horses enough to raise its rubbish.⁷ 'Kibbles,' or heavy iron buckets, are still clung to in many of the works. In others this clumsy method of haulage has been supplanted by the use of 'skips,' which travel between guides after the fashion of ordinary freight lifts.⁸

The transportation of ore had been effected by means of pack-horses, but, as mines became deeper and more extensive, this method grew not only expensive, but entirely inadequate. So much ore was raised in 1750 at Polberran, St. Agnes, that carts had to be pressed into service. The Fowey Consols, one of the larger mines, maintained in its service mules by the hundred.⁹ Tramways were the first to super-

sede the pack-horse, their introduction into Cornwall occurring in 1818,¹⁰ but in the course of a few decades we find them pushed aside by the steam railway, with its branch lines reaching to the shaft's mouth.

With the deepening and better drainage of the tin mines, came improvements in their general engineering. Originally the lodes were followed from the shafts at points where they were rich, and without any attention to order or regularity, the workmen throwing the deads behind them into the worked-out places as they proceeded. They were led on by a bunch of ore, and when that failed their work was done. While lifting power was limited, this was, undoubtedly, the most economic mode of procedure, but it remained at best a hand-to-mouth sort of arrangement, inevitably destined to give way to other and better forms.

It was probably difficult to pursue this system where the water was 'quick,' so another was adopted, namely, that of stoping downward from the shaft (i.e. hewing away the lode in stairs, or steps, of 6 or 8 ft. in height, one man following another). On this system, as soon as the shaft is sunk 6 or 8 ft. under the adit, if the lode is productive the first step is commenced, a second follows it, and a third as soon as the shaft is sufficiently deep.¹¹

The facilities for exploring the lode, and making new discoveries, were scarcely greater by this system than by the last, and a further improvement soon followed, namely, that of driving levels, or horizontal galleries, on the lode from the shafts, and stoping the lode downward from one level to another. On this plan, although the mine was explored by the levels, the ore was taken away almost as fast as the shaft was sunk, and if any unexpected changes took place, if, for instance, the lode should, even for a short space, become unproductive, the mine had no resources in itself to furnish the means of paying its ordinary expenses.¹² Independently of the risk, this system was enormously expensive, for, in the first place, obviously, even if all the lode were ore, a mass can be taken away from above at much less cost than from below. This, however, was the least important part. In stoping downward the whole lode, good or bad, had to be removed, as it was impossible to get at the ore without removing the dead ground also, all of which work had to be done before the lode was properly drained. The mixture of ore

¹⁰ There is no mention to be found of any use of the self-acting planes and other devices preceding the tram in the northern coal mines. The Cornish mines are very tardy in their introduction of the tram. It had been employed in the coal mines as early as 1765 (Galloway, *Annals of Coal Mining and the Coal Trade*, 283, 318, 329-331, 370).

¹¹ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 67.

¹² *Ibid.* 69.

¹ Childrey, *Britannia*, 8. R. Carew, *Survey of Cornwall* (ed. 1811), p. 35.

² Pryce, *Mineralogia Cornubiensis*, 178.

³ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 64. R. N. Worth, *Historical Notes concerning the Progress of Mining Skill*, 58.

⁴ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 63-64.

⁵ Worth, *Historical Notes concerning the Progress of Mining Skill*, 26. *Rep. on Stannary Act Amend. Bill* (1887), Q. 710, 711.

⁶ Galloway, *Annals of Coal Mining and the Coal Trade*, 283.

⁷ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 61.

⁸ Hunt, *British Mining*, 596-597.

⁹ Worth, *Historical Notes concerning the Progress of Mining Skill*, 48.

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with rubbish meant extra expense in dressing, and caused considerable waste, as, when so much washing was necessary, the finer parts of the ore were liable to be carried off by the water.¹

The downward stope began to be abandoned towards the end of the eighteenth century² for the system which prevails at present, namely, that of driving levels and stoping upwards. As soon as a shaft is sunk to sufficient depths beneath the adit, a level is commenced upon the lode, and carried both east and west. If the latter is rich at the commencement of the level as the workman goes forward, another is employed to dig down the ore above the level, and, as he makes progress, a third follows him in another stope, and so they proceed, until the intermediate part of the lode (or as much of it as is productive of ore) is wholly removed.³ Meanwhile the shaft becomes deep enough for several other levels long before the ore above the first is exhausted. If the lode is poor in the first level nothing more is done. If it becomes productive in some parts at a distance from the shaft, there the miners begin to stope.

The advantages of this system are several. In the first place it is easy to find what part of the lode is rich and what barren, and the miners have it in their power to take away the valuable parts and leave the worthless. Even the latter are useful, as they serve the purpose of timber in keeping the mines open. Every part of the works is better drained. The ore, by being taken from the lode when comparatively dry, is more easily kept separate from the worthless ground, and is therefore subject to little waste and costs much less to dress. The riches of the lode may be extracted more speedily, and the produce is far less fluctuating. The ability exists also to make greater efforts for the discovery of new bunches of ore in other parts of the lode, and, as a general consequence, the mine is not only more profitable but much more permanent.⁴

I have left until the last the history of the internal organization of the mines and of the classes who operated them. To trace through a thousand years the development of the tin works from shallow pits owned and worked by groups of labourers to the vast companies of to-day which employ in their works thousands of hired labourers, is a task which calls for great discrimination, and which, perhaps, may be best accomplished by a reversal of the usual order of

procedure, and an exposition first of the present and then of the past.

The mines to-day are run either as corporations,⁵ or, by virtue of local mining law, as cost-book companies.⁶ The latter form is the older of the two. Under the cost-book system two or three men secure a lease of a property⁷ and induce some others to join them; if the property seems promising, these few would include a banker, a smelter, an iron, timber, candle, and cordage merchant, and possibly a dealer in new and second-hand machinery. They then register, under the cost-book, a company of, say, 512 shares, and are ready to begin business. They hold a meeting, elect a purser to manage the accounts, and call up, say, £1 per share. At the next meeting perhaps a call of £1 or more is made, and so matters continue until one of three things happens: the mine becomes self-supporting; it earns profits, in which case there is a division; there comes a call to which the chief adventurer refuses to respond, in which case if the others refuse, or are unable, to take up the defaulter's shares, the mine closes. If the proceeds from the sale of lease and machinery are insufficient to liquidate the mine's liabilities, then the adventurers are called upon to contribute *pro rata*; and as long as a single moneyed man remains among them the creditors are sure of recovering. Such is the system as it was in the days when Cornish tin mining was at its height. With the advent of modern speculative enterprise the number of shareholders has increased⁸ in most cost-book concerns, and 'out-adventurers'⁹ have entered—that is, partners not residing in the district. A new system has now become engrafted upon the old, and the general body of adventurers usually delegate their powers to a managing committee,¹⁰ consisting as a rule of the largest resident shareholders.

In spite of these changes, however, the undertaking has remained quite unlike the usual corporation or partnership, and its main features still hold true. These are: first, absence of fixed capital; secondly, the right to transfer shares by giving written notice to the purser,¹¹ and without the consent of one's partners; thirdly, the right of any adventurer to relinquish his interest upon

⁵ James, *Pseudo-Cost-Book Companies*, 22.

⁶ The Companies Act of 1862 brought the limited liability system into the stannaries. Before that, all the mines were cost-book concerns (*Rep. on Stannary Act Amend. Bill* (1887), Q. 119).

⁷ *Cornish Mining*, 11; Bartlett, *Treatise on British Mining*, 24.

⁸ Cost-book companies are now so extensive that meetings are usually held, not monthly, but at intervals of sixteen weeks, so as to allow distant shareholders to attend (*Rep. on Stannary Act Amend. Bill* (1887), Q. 17).

⁹ James, *Pseudo-Cost-Book Companies*, 31.

¹⁰ Watson, *Compendium of Brit. Mining*, 11.

¹¹ Pike, *Britain's Metal Mines*, 52.

¹ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 69–70.

² Worth, *Historical Notes concerning the Progress of Mining Skill*, 14.

³ 'Improvements in Mining,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 70.

⁴ *Ibid.* 70, 71. Hunt, *British Mining*, 602 et seq.

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written notice;¹ fourthly, the right of joint management; fifthly, the continuance of the adventure as long as any remained to work it; sixthly, the frequent settlement of accounts in the periodic cost-book, and the enforcement of contributions by the purser in the stannary court; seventhly, the right of excluding defaulters from participation in the profits; eighthly, the liability of mine, machinery, and produce to the claims of creditors; and, lastly, the fact that the adventurer's interest lies, not in any capital which he may have advanced, but simply in the mine itself.²

It should be noted that the liability of the adventurer, though restricted in kind, is unlimited in amount, so that during his partnership he is liable for the whole of the engagements incurred in the ordinary course of mine management. Should a mining company attempt to default its dues, its creditors have action, solely against the purser,³ by petition, in the vice-warden's court, and, upon non-payment, the court will order a sale of the mine materials and produce.⁴ On the other hand, the purser may obtain his remedy in the stannary courts against an adventurer who defaults his obligations.⁴

Under this system the control of operations rests with the purser.⁵ He keeps the accounts, authorizes the purchases of materials and stores, hires the labourers, recommends assessments upon the adventurers, summons the shareholders to monthly or bi-monthly meetings, and, at each, reads his report and prepares his statements.⁶ Next in importance to the purser stands the chief captain, or manager, who superintends the entire mine⁷ and the general routine of surface-work, and under him are sub-captains, usually selected from the most intelligent workmen, who act as foremen or inspectors of the work underground, are held strictly responsible for the work of their section, and are stimulated by prospects of advancement.⁸

It is, however, the wages system which has attracted most attention. The Cornish miner's year is divided into various periods, and at the end of each occurs a 'setting day.' Some time before, the agents or captains go through the mine and decide what work is to be done in the succeeding period—that is, what shafts are to be sunk and what levels driven. They also de-

termine how many 'pitches' or divisions of the lode are to be worked. They estimate the quantity and quality of the ore which these pitches are likely to yield, and the amount of labour that must be devoted to the work; and, in a similar manner, they decide upon the amount of labour which can be done in a given time, in preparing the way for the extraction of the ore, and determine, for example, the quality of the ground through which the shafts, or winzes, are to be sunk, or the levels driven.

On the setting day, the men employed in the mine, with those who have come from elsewhere, desirous of work, assemble around the account-houses or a platform, where the chief agent, or captain, takes his stand. He reads the rules under which the mine is to be worked, and then auctions off, to small groups of workmen, different pitches or pieces of work in the mine, to the lowest bidders, who, in this case, represent bodies of from two to eight men and boys, who work together. When the men go to work they are charged for the materials they use, in the shape of tools, candles, powder, and other necessities, as well as for the cost of hauling the rubbish to the surface. At the end of the period for which the contract is let, a balance-sheet is prepared; they are credited with the amount of work they have done and debited with its cost, and frequently also with a subscription for medical attendance and the maintenance of a club, which supplies them or their families with aid in case of accident. Sometimes, in addition, these 'tut workers,' as they are called, are credited with the small percentage of ore that may be extracted in the course of their operations in order to induce them to keep it as separate as possible from the rubbish, and, during the progress of the work, they frequently receive payments on account.

So far, then, for the work of preparing the way. We have next to consider the actual work of excavation. In this case the work to be done is divided into small compartments, or pitches, and, in like manner, put up to auction, except that here the men offer to do the work in consideration of receiving a percentage of the price realized from the ore, after paying the cost of reducing it to a saleable state. This is the so-called 'tribute system.' As is the case with 'tut' work, the miners pay their own costs in tools and materials, while to provide for their support, until the balance is handed over to them, they obtain certain customary advances from the adventurers known as 'subsist.'⁹

This system, described in the nineteenth century by Tuckett,¹⁰ Laing,¹¹ and Watson,¹² to

⁹ 'West Barbary,' by L. L. Price, *Journ. Roy. Statist. Soc.* li, 494-566.

¹⁰ Tuckett, *Present State of the Labouring Population* (ed. 1846), 223-226.

¹¹ Laing, *National Distress*, 40, 41.

¹² Watson, *Compendium of British Mining*, 11-14.

¹ The retiring shareholder is entitled to withdraw in cash his share of the mine machinery and materials, the value of which is usually left to arbitration (*Rep. on Stannary Act Amend. Bill* (1887), Q. 14).

² James, *Pseudo-Cost-Book Companies*, 22, 45.

³ Convoc. Cornw. 2 Jas. II, c. 6.

⁴ James, *Pseudo-Cost-Book Companies*, 15.

⁵ Cf. Pryce, *Mineralogia Cornubiensis*, 173.

⁶ Bartlett, *Treatise on British Mining*, 24; Watson, *Compendium of British Mining*, 11.

⁷ Pryce, *Mineralogia Cornubiensis*, 174.

⁸ 'The Economy of Mining,' *English's Quart. Mining Rev.* iv, 265.

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say nothing of many others,¹ is one of great antiquity. It certainly existed in 1778, for it is described at that time by Pryce. 'Mining,' he says, 'is so expensive and uncertain that few Cornish mines are carried on at the risk of one or two persons. Many partners are united; four, ten, sixteen, twenty-four, or thirty-two in number.'² He then describes the meetings of these companies, the familiar cost-book system being the one almost invariably employed, and the funds of the adventurers being vested in a purser, as we have seen. 'Deep and chargeable mines are carried on by persons of fortune or great skill, but shallow mines are occupied indifferently by such, or by the labouring miners, and, frequently, by both.'³

He then proceeds to speak of the wages system. 'It is a good and customary way⁴ for the owners to set their dead ground, either in or out of the lode, to be sunk, driven, stoped, or cut down by the fathom, but if there is no choice in respect to saving the ore drawn, or the like, they set it to be sunk . . . upon tut—that is, a piece or part of unmeasured ground by the lump for such price as can be agreed upon;' and from the same passage we learn that, as at present, the work was done by a small gang of workmen who supplied their own tools and materials. When the lode had been tapped two methods again might be used. The ore might be broken by the fathom,⁵ or, secondly, by the tribute system, only instead of being simply a matter of bargain between workmen's gangs and the adventurers, it was more complex. First to be noted is the fact that tin works were often given over to a single tributer.⁶ 'Adventurers very often lease a mine on tribute. Some miner takes the mine of the adventurers for a determined time—that is, for half a year, a whole year, or seven years. If it is a tin mine he articles, first, to pay the lord his share or dole free of all cost. . . . This must be such a proportion of all the tin-stuff as shall be raised during the limited time. Of the remainder he pays the adventurers one moiety, or one-fourth part, according to the agreement, it being more or less in proportion to the richness of the mine.' Often also the tributer was associated with several others, who clubbed together to provide the necessary capital for machinery and wages.⁷ More commonly, especially in the larger works, the mine was divided into pitches, as at present, and auctioned off to small gangs.⁸

We may draw from these facts the conclusion that the entire mining system was undergoing a transition. The gentlemen adventurers were

gradually ceasing to work their mines, and giving them to small masters on tribute. But the small masters in the following years were ousted from their position by aggregations of working tinners themselves.

Further information is furnished by Jars, who visited Cornwall in 1765. His words are as follows:—'L'usage établi dans toutes les mines est de donner l'extraction du minerai par entreprise, les entrepreneurs ont des ouvriers à leurs gages, qui travaillent sous leurs ordres; quelques uns sont ouvriers eux-mêmes.'⁹ On a day previously set, the account continues, those interested in a mine assemble, and the contractors make offers, bidding downwards. The workmen find themselves the necessary tools, light, and powder. The adventurers provide for the maintenance of machinery and ropes. The number of workmen who do the work is usually from seven to nine, and the time of contract six months. The contract is determined by a portion of the mineral extracted—that is, the contractors receive a third, a fourth, or a fifth of the value raised.

Here, again, we have the main outlines with some of the details of the system already described. The actual workmen appear for the most part to have been hired for wages, and to be under contractors who agree to excavate the ore for a certain proportion of the selling price; and it is to be noted that although the entrepreneurs are said elsewhere to be compelled to have workmen of all kinds, yet no express mention is made by Jars of the work to be done in preparation for the extraction itself. It will be remembered that the work of extraction, according to the description already given of the work of the present day, was assigned to tributers, and the work of preparation to tut workers, who approach more closely to the ordinary wage earners; yet Jars, confining his attention to the work of extraction, speaks of the actual workmen as hired for wages. But he also states that in some cases the entrepreneurs are actual workmen, and in other passages says that simple workmen often commence the exploitation of a mine at their own risk.

Can we trace these systems farther? Tut work we do not find until 1778, and it seems to have had as predecessor the piece-work system, concomitant with it at that date. But the tribute system is much older. Carew tells us that small undertakings were worked by men single-handed, but that usually the discoverer of a lode took others into association, because 'the charge amounteth mostly verie high for any one man's purse except lined beyond ordinarie.'¹⁰ The adventurers were either working miners or capitalists who put in hired labour. Large works were carried on under the direction of a captain, and toll was paid to the lord of the soil, or the lord

¹ 'The Economy of Mining,' English's *Quart. Mining Rev.* iv, 266; Babbage, *Economy of Machinery and Manufactures* (ed. 4), § 307.

² Pryce, *Mineralogia Cornubiensis*, 173.

³ Ibid. 174.

⁴ Ibid. 175, 180.

⁵ Ibid. 188.

⁶ Ibid. 180.

⁷ Ibid. 187.

⁸ Ibid. 189.

⁹ Jars, *Voyages Métallurgiques*, iii, 202.

¹⁰ Carew, *A Survey of Cornwall* (ed. 1811), 33, 34.

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and boulder. Here we have the same gradations as exist at present, and here, moreover, we find the germs of the cost-book system. The produce is shared out in 'doles,' and a proportionate division made of the charges.¹ Instead of dividends each adventurer had his share of black tin, after the payment of toll, and each man carried his share to the blowing-house, and, after coinage, sold the white tin either to the London merchants or to the wealthier tanners.

Carew's account is preceded by that of Beare in 1586. He begins by enumerating the various classes of stannary workers. There are the charcoal pedlars, who go from blowing-house to blowing-house with their packs.² There were the blowers³ and the owners of blowing-houses. There were smiths, carpenters, and other artisans employed about the mines, and, finally, the miner himself. 'The most part of the workers of the black tyn and spaliers are very poor men, and, no doubt, that occupation can never make them rich, and chiefly such tyn workers as have no bargain, but only trust to their wages, although they have never so rich a tyn work, for they have no profit of their tyn, if they be hired men, saving only the wages, for their masters have their tyn. Now, if they should chance to be farmers themselves, and their worke fall bad, then run they most chiefly in their master's debt, and likely to incur more and more rather than to requite any part thereof, for of these two choyses, to be a hired man or farmer, the one is a certaintie, and the other an uncertaintie. The farmer knoweth not how his work will doe, until tyme that he have proved it, and must needs live in hope all the yere, which for the most part deceiveth him.'⁴

Putting this with what we have learned concerning the practice later, and supplying other portions of the manuscript, the situation becomes clear. Many of the mines were worked by groups of miners adventuring in partnership,⁵ and these are meant when reference is made to the wealthier sort of tanners who work side by side with the poor spaliard, the latter in this case being the former's hired man.⁶ Other mines were farmed in shares by the adventurers to other spaliards, who to all intents worked under the tribute system. If we read on further we find other curious coincidences. There is a captain, and, as at the present day, he represents the adventurers with this difference, that instead of being the mere agent of the mine owners, whose duty it was to auction off the shares, he was the chosen head of a body of adventuring miners,⁷ and assigned to his fellows their pitches for the next term. Beare gives us no hint as to whether there was at this time a captain in the

sense that one exists to-day. He states, however, that most of the spaliards work for wages, with the implication that the tribute system was comparatively limited.

We have then, first, independent miners working their own mines; secondly, that system under which the adventurers relinquished the actual work to miners on the tribute system, leaving parts of the mines for various percentages of the product; thirdly, a system was, without doubt, coming in by virtue of which the adventurers worked their claims, as small entrepreneurs, with hired labour. 'The tinner,' says Beare, 'in my judgement is he that giveth wages by the year to another to work his right in a tinwork for him as a dole, or half dole, more or less, or else works his right himself, as many do.'⁸ These labourers were paid by the amount of ore excavated, and received part at least of their wages in tin.⁹

The process of transformation, although we cannot trace its various phases distinctly, seems quite clear. The working adventurer has maintained his standing. Beare refers to him;¹⁰ Carew mentions him in 1602;¹¹ his case is dealt with in the stannary laws of partnership;¹² Jars in 1765 speaks of him;¹³ and Pryce in 1778.¹⁴ By the nineteenth century, if not earlier, this class was confined mainly to stream tanners,¹⁵ but it still survives, although in diminished numbers. The cost-book system, as it exists to-day, had its origin in the voluntary association of groups of several of these men, for the purpose of exploiting a mine too large for any to work single-handed. By 1586, however, if not before, there had arisen a class of gentlemen adventurers who, instead of working their shares, let them out to tributers. The latter became in due time small entrepreneurs, as some of the gentlemen adventurers already were, with hired labourers, and this was the prevailing method when Jars wrote. But by that time the labourer in turn had begun to improve his position, and accordingly we find him in the latter part of the eighteenth century superseding his erstwhile employer, and taking up the tribute system on his own account. Finally the hired labourer, or 'spalier,' who in Beare's time was probably, as when Jars wrote, employed to open a mine, gradually advanced from time wages to piece wages, and by 1778 to tut work.

Other classes of tanners remain to be noted. We find in Cornwall two groups of middlemen,

⁸ Ibid. 6380, fol. 6.

⁹ Lansd. MS. 76, fol. 34. Doddridge, *Hist. of Cornw.* 94, 95.

¹⁰ Harl. MS. 6380, fol. 6.

¹¹ Carew, *Survey of Cornwall* (ed. 1811), 30-34.

¹² Convoc. Cornw. 22 Jas. I, c. 19.

¹³ Jars, *Voyages Métallurgiques*, iii, § 10.

¹⁴ Pryce, *Mineralogia Cornubiensis*, 178.

¹⁵ *Literary Panorama*, iii, 1238-1241.

¹ Carew, *A Survey of Cornwall* (ed. 1811), 40.

² Harl. MS. 6380, fol. 37. ³ Ibid. fol. 32-39.

⁴ Ibid. fol. 56, 57.

⁵ Ibid. fol. 6.

⁶ Ibid. fol. 6.

⁷ Ibid. fol. 58.

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the one purchasing the ore from the miner,¹ and having it blown at one of the houses, or perhaps himself a smelter; the other purchasing and re-selling the tin when smelted.² The presence of these men gave rise to an interesting system of money advances, which has left traces even at the present day.³

Let us begin by a review of the conditions as they are depicted by Carew. 'When a western gentleman,' says the latter, 'wants money to defray his expenses at London, he goes to a tin merchant for a loan. Usually he has to give bond for a thousand-weight of tin for every £20 he borrows, the said tin to be delivered at the next coinage.⁴ But the business goes still farther. The merchant, that he may be sure to have tin for his money at the time of coinage, lays out great sums beforehand unto owners of tin works, who are bound to deliver for the same so many thousands of tin as the money shall amount to after the price agreed upon at the coinage. To them resorts the poor labourer desiring some money before the time of his payment at the coinage time. The other at first says he has none . . . and in the end . . . he delivers to him wares instead of money, and the labourer is under bond to deliver tin at the coinage. And this extreme dealing of the London merchants and country chapmen in white tin is imitated by the wealthier sort of dealers in black tin.⁵

'The wealthier tanners, laying out part of their money beforehand, buy black tin from the poor labourers at so much per mark, i.e., look how many marks there are in the price made at the coinage for the thousand-weight, so many two-pence halfpenny, threepence, or fourpence, partly after the goodness, and partly according to the hard conscience of the one and the necessity of the other, shall he have for the foot, as if the price £26 13s. 4d. per thousand-weight, therein are forty marks, then shall the poor tinner get of him who deals most friendly, per foot of black tin, forty times fourpence, or £20 per thousand-weight, and less for the worst.'⁶

These facts, besides being recognized by stannary law itself,⁷ receive confirmation from other writers of the same period. Beare, who wrote in 1586, corroborates the account,⁸ and further particulars even have been added by a manuscript of the year 1595.⁹ The result of the system under which the merchants at the top drove hard bargains with the dealers in black tin,

or directly with the gentlemen adventurers or small independent miners, and the adventurers repeated the operation upon their dependents, was the depression of the labourer.¹⁰ Thus in 1586 the wage worker received but £3 a year for the working of a dole, from which he was obliged to support himself and family.¹¹ Raleigh, a few years later, according to his own claims, was instrumental in getting this raised from 2s. to 4s. per week.¹² In 1602 Carew mentions the wages of the 'hireling as 8d. per day, or from £4 to £6 per annum.'¹³ In 1667, coincident with the gradual rise in wages throughout England, we find that the pickman received 7s. per week, where formerly he had had four, the common tinner 5s. in place of three, and others 4s. instead of two and a half.¹⁴

Already the evils of this system of tin purchase had become so notorious that the preemption monopolies then projected were actuated largely by the humane motive of freeing the miners from the London merchants by supplying them with a permanent market. Pursued intelligently, this plan might have borne good fruit; but, as it was frequently interrupted, it subjected the stannary system to repeated and violent wrenches, causing the tanners to forfeit their bonds¹⁵ to the dealers, and giving them much hardship in other ways. The terms, besides, under which the monopolists purchased the miners' product were rarely generous,¹⁶ although in many cases provision was made for a loan fund, upon which the stannary workers might draw in advance upon security of tin.¹⁷

The weight, of course, which bore the tanners down, was the fact that they could not sell their product save twice a year, at the coinages; and this becomes apparent during the brief period of the Commonwealth, when the coinage system fell into disuse.¹⁸ The removal of all restriction

¹⁰ The plight of the tin-mine owners, caught, as it were, between the exactions of the dealers and the difficulties in mine drainage, was like that of the colliery owners at the same period (Galloway, *Annals of Coal Mining and the Coal Trade*, 151; *Cal. S. P. Dom.* 1637-1638, 387). The lead smelters in Yorkshire similarly preyed upon the lead miners (Malynes, *Lex Mercatoria* (ed. 1622), 269).

¹¹ Harl. MS. 6380, fol. 57.

¹² Dewes, *Parliamentary Debates*, 299.

¹³ Carew, *Survey of Cornwall* (ed. 1811), 34. This would be about the wage of unskilled labour (Rogers, *History of Agriculture and Prices in England*, vi, 623).

¹⁴ From an old manuscript volume in the Duchy of Cornwall Office. See also Westcote, *View of Devon*, 52, 53; Norden, *Speculi Britanniae Pars*, 12.

¹⁵ S. P. Dom. Mary, iv, 5. Cotton MS. Titus B. v, fol. 402. S. P. Dom. Jas. I, viii, 136.

¹⁶ Lansd. MS. 1,215, fol. 226-230. S. P. Dom. Eliz. cclxxiii, 74; cclxxxvi, 26. Receivers' Rolls, 11 & 13 Jas. I, 9 Chas. I.

¹⁷ Lansd. MS. 24, fols. 44, 47, 48, 50. S. P. Dom. Eliz. cclxxxvi, 26. Add. MS. 6713, fol. 437-442. Treas. Papers, ccviii, 30.

¹⁸ *The Tanners' Grievance*.

¹ Harl. MS. 6380, fol. 35.

² S. P. Dom. Eliz. ccliii, 46.

³ 'West Barbary,' by L. L. Price, *Journ. Roy. Statist. Soc.* li, 532, 533.

⁴ Carew, *Survey of Cornwall* (ed. 1811), 48.

⁵ Carew, *Survey of Cornwall* (ed. 1811), 49.

⁶ Ibid. 50.

⁷ Smirke, *Vice v. Thomas*, App. 58. Presentment of Customs, Tywarnhail, 1604.

⁸ Harl. MS. 6380, fol. 109.

⁹ Lansd. MS. 76, fol. 34. S. P. Dom. Eliz. ccliii, 46.

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upon sales sent the price of tin far above its former level, and the labourer's wages rose accordingly; but with the Restoration the coinage was reimposed, and matters fell into their old ways, the century ending in a long depression among the mining classes of Cornwall, during which thousands of miners were driven to semi-starvation.¹ At the expiration of the last pre-emption in 1717, the dealers again closed in,² and the situation in 1811 is described by Carew's editor as no better than two centuries before.³

The task of tracing these various institutions back into the Middle Ages is one which the absence of all stannery account rolls renders extremely difficult. Of the most primitive type of miner, the working adventurer, we again find traces in 1510.⁴ The further back we go the more likely are we to find these small stream works carried on by associations of labourers. Scattered references in mediaeval records point to such an organization. Henry Nanfan *et socii sui* complain to the Black Prince that they are molested in their tin work at Lamorna Moor.⁵ Entries in a coinage roll of 1305 show certain quantities of tin accounted for by Ben Rynwald and his associates.⁶ As late as 1495 so little did the custom of the stanneries contemplate the possession of tin bounds by any but working tinnerns, that Prince Arthur's ordinances provided that 'no persone, neyther persones, having possession of lands and tenements above the yerely value of £10, or noone other to theyr use, be owners of eny tynwork or parcell of any tynwork, with the exception of persons claming by inheritance or possessed of tynworks in their own freeholds.'⁷

But the tinner was probably not dependent wholly upon his mine. An analysis of several of the coinage accounts result in figures of no small interest. Thus in Cornwall in 1300 we find that nineteen men presented tin in amounts of less than a thousand-weight; fifty-five, from one to three thousand; twenty-nine, from three to seven; thirteen, from seven to twelve; eleven, from thirteen to seventeen; and, finally, seven

men who present amounts varying from thirty-three to 294 thousand-weight.⁸ The same might be repeated for almost any year. Even as late as 1524 432 tinnerns presented less than a thousand-weight each, amounts which in many cases must have been supplemented from the earnings of by-occupations.⁹

Many of the tinnerns were doubtless small farmers or fishermen. John Aunger, the blower, was, as we know, a husbandman as well;¹⁰ and in later years, when the mines were said to be decaying, a constant subject for complaint was that the tinnerns were leaving the stanneries and turning to husbandry.¹¹ During the Commonwealth, on the other hand, we find the process reversed, and artisans and clerks forsaking their callings to become tinnerns.¹²

Another point which seems indubitable is the fact that at an early stage in history we meet with tin works of considerable extent run upon capitalistic lines. Just how far this tendency had gone by the fourteenth century we are unable to say, but it should be remembered that one of the chief complaints which the two shires continually made was that not only the stannary workmen but their masters were claiming the franchises of the mines.¹³ Of Abraham the tinner we are told that he owned six large stream works, where he employed over three hundred workmen. The Statute of Labourers was, as we know, enforced in the mines,¹⁴ and in 1342 occurs the case of Michael Trenewyth, and others, large tin producers,¹⁵ who 'usurped works, and compelled stannary men to labour there for a penny a day, whereas before they worked above twenty pence worth of tin each day, with the result that the tinnerns have all left their mines.'¹⁶

Yet, side by side with the entries of miners' associations and of large tin producers, appear on the coinage rolls the names of persons who could not have worked the mines with their own hands, and who could not all have been purchasers of ore, and the smallness of whose accounts shows that they could not have been small entrepreneurs. We find, for example, that

¹ *The Tinnerns' Grievance*. Yarranton, *England's Improvement*, pt. ii, 149.

² Lansd. MS. 1215, fol. 230.

³ Carew, *Survey of Cornwall* (ed. 1811), 50, n. Pryce, *Mineralogia Cornubiensis*, fol. 293.

⁴ Add. MS. 6713, fol. 251.

⁵ White Book of Cornwall, cited by Smirke, *Vice v. Thomas*, App. 26.

⁶ P. R. O. Exch. K. R. Accts. bdle. 261, No. 1.

⁷ Add. MS. 6713, fols. 101-104. The laws of other free miners abound with passages which show that this type was the prevailing one in the Middle Ages. Thus one of the Mendip laws provided that whoever should 'throw the axe,' in any 'groof or gribb' should be one of the eldest partners (*Trans. Roy. Geol. Soc. Cornw.* vi, 331). It is a curious fact that in the Tasmanian tin districts to-day a system of co-operative 'streaming' is prevalent ('Tin Fields of Tasmania,' by John Mufford, *Proc. Mining Inst. Cornw.* i, No 5, pt. 161-162).

⁸ P. R. O. Exch. K. R. Accts. bdle. 260, Nos. 20, 21.

⁹ Ibid. bdle. 271, Nos. 9, 12.

¹⁰ *Cal. of Pat.* 1426, 108.

¹¹ Lansd. MS. 86, fol. 67; 19, fol. 99.

¹² *The Tinnerns' Grievance*.

¹³ *Parl. R.* (Rec. Com.), ii, 343-344. P. R. O. Lay Subs. R. bdle. 95, No. 12. Smirke, *Vice v. Thomas*, App. 13, citing *Annales Monasterii Burtonienses*, 290 (1237). Hired labourers were common enough in the Mendip mines in the fifteenth century to be subject to special regulations. ('Certain Peculiarities in the old Mining Law of Mendip,' by C. Lemon, *Trans. Roy. Geol. Soc. Cornw.* vi, 327-333).

¹⁴ P. R. O. Ct. R. bdle. 156, No. 27; bdle. 161, No. 81.

¹⁵ P. R. O. Exch. K. R. Accts. bdle. 262, No. 26.

¹⁶ Pat. 16 Edw. III, pt. ii, m. 15 d.

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John the mercer presents five hundredweight ;¹ Henry, earl of Devon, one hundredweight ;² John, earl of Cornwall, ninety-four thousandweight ;³ Thomas the goldsmith, four thousandweight ;⁴ while Richard the smith, Thomas the pewterer,⁵ John Trenagoff the clerk,⁶ Michael the skinner,⁶ John vicar of Bodmin,⁵ Ralph rector of the church of St. Ladoce, Johanna the widow of Ralf Barson,⁷ Ralph the chapman,⁸ John the merchant,⁹ and Alfred the prior of Mt. St. Michael's,¹⁰ all figure in the lists. It may be stated with confidence that most of these people were simply members of mediaeval cost-book companies, such as those to which the Black Prince referred when, after the Plague, he forbade the tanners to withdraw from the mines either the labour or the expense that had usually been bestowed.

As to the wage system, whether the workmen were paid by the piece, day, or tribute system, it is not for us to say. Probably several methods were employed. One of the complaints against Trenewyth was that he gave his men but a penny a day, while it would seem from the statement of John Thomas, a small mine owner early in the fifteenth century,¹¹ that he paid his men by the piece, or by the tribute method.

In endeavouring to trace back the contract system of tin purchases, so prevalent in the days of Elizabeth, it will be necessary to bear in mind, first, that the great factor making for the system, namely, the prohibition of sales except at the coinages, was in force as early as we have definite knowledge ;¹² secondly, that already in 1198 a distinct class differentiation existed, including diggers, smelters, ore buyers, and tin dealers.

Our earliest authority has hitherto been Beare, whose account dates back to 1586. But in 1553 the system was employed, as we learn by an

inspection of the papers relating to the Brokehouse preemption.¹³ Still earlier we have in 1492 a proclamation from Henry VII, appointing Southampton the staple for tin, and decreeing two extra coinages 'because the poor tanners have not been able to keep their tin for a good price, when there are only two.'¹⁴ In 1405 complaint was made in Parliament of the 'merchants with ready money who go about Cornwall, and, taking advantage of the poor tanners, buy their tin cheap, and so keep down the price.'¹⁵ In 1347, on occasion of the grant of the preemption to Tideman of Limberg, the 'merchants of England' petitioned that the patent be revoked. They had, in the past, been used to purchase Cornish tin, but now no one can buy except the patentee.¹⁶ In 1315, in the tanners' petition against the exactions of Antonio of Pisa,¹⁷ they mention the fact that, before his patent, they sold their tin to merchants coming to Cornwall in exchange for wines, cloths, and wares. In 1304 the merchant buyers of Cornish tin petitioned the king that they might have two days in which to pay their coinage duties.¹⁸ But why should they pay coinage duties rather than the tanners themselves? Evidently because, at this time, as in the sixteenth century and later, the tanners pledged their metal in advance to the dealers, and, on getting the vouchers for their tin from the coinage officers, delivered them to their merchant creditors, who then, as later, discharged the dues, and claimed the tin.¹⁹

In the absence of data to the contrary, the evidence presented, although meagre, points to no important change in stannary economy from the Middle Ages down to the sixteenth and seventeenth centuries. There was still the cost-book system, still the non-working shareholder, and still the working adventurer, who, together with the employés in the larger works, was depressed by the coinage, with the forced sales which it engendered.

The preceding pages, with some exceptions, have been devoted to a description of the mines as they existed until within the last century.

¹ P. R. O. Exch. K. R. Accts. bdle. 265, No. 25 (1463).

² Ibid. bdle. 271, No. 13 (1524).

³ Ibid. bdle. 262, No. 26 (1333).

⁴ Ibid. bdle. 265, No. 20 (1456).

⁵ Ibid. No. 12 (1432).

⁶ Ibid. bdle. 261, No. 6.

⁷ Ibid. bdle. 262, No. 29 (1333).

⁸ Ibid. bdle. 263, No. 1 (1334).

⁹ Ibid. bdle. 262, No. 21 (1331).

¹⁰ Ibid. bdle. 261, No. 1 (1305).

¹¹ *Chancery Proc. in the Reign of Elizabeth*, i, p. xiii. In the accounts for the king's silver mines in Devon, all sorts of payments appear side by side. The miners were paid by the day, and occasionally by the piece, with also special payments for special jobs. As we might expect in a mine of that sort, no trace of tribute appears, but tut work was not uncommon. The hands not actually engaged in excavation were usually paid by the day or by the piece, and many of the miners seem to have turned their hands to all sorts of surface work as well (P. R. O. Exch. K. R. Accts. bdle. 260, No. 3 ; bdle. 266, No. 25).

¹² Before 1198 (Black Book of Exchequer, No. 10).

¹³ S. P. Dom. Mary. iv, 5.

¹⁴ Pat. 7 Hen. VII, pt. i.

¹⁵ *Parl. R.* (Rec. Com.), v, 334b.

¹⁶ Ibid. ii, 180, 188. ¹⁷ Ibid. i, 308.

¹⁸ Ibid. i, 163a.

¹⁹ There is plenty of evidence in support of the view that the relations of the tanners with the dealers were but typical of conditions throughout the mining districts of England in the Middle Ages. A provision of the Derbyshire customs confirmed in 1288 is to the effect that the barmaster is not to prevent the payment of debts by any miner to any man who has given him money beforehand for his ore (Add. MS. 6682, fol. 65, 69 ; Pike, *Britain's Metal Mines*, 31). In the Forest of Dean, an attempt was made to keep down the evil by the provision that no free miners could become smiths (who were the purchasers of the ore) and still retain their mining privileges (Houghton, *The Compleat Miner*, pt. ii, art. 33).

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The years following have brought many changes. Of the stannary courts, those of the stewards have been merged in the common-law courts since the Stannary Act of 1837,¹ and that of the vice-warden reformed and given cognizance over all mining cases in the two counties. The old customs and privileges have for the most part fallen into disuse. Freedom from ordinary taxation vanished long ago.² Bounding, although never formally abolished, is no longer practised. The courts eventually decided that the landlord of a proposed claim must be given three months in which to take it himself, thus effectually nullifying the bounder's ancient right. The custom therefore arose of leasing the desired plot under terms of toll which even now remain much as in former centuries.³ The mines are still largely cost-book companies, but in the wages system a change has become noticeable. By 1827 the tribute system had apparently assumed its modern form. The pitches at this time, however, were generally let for two months, and seem to have been usually apportioned to from two to four men only.⁴ In the *Penny Magazine* for 1836 the system is described in identical general terms, but it is also mentioned that the pitches, which were let at one time for periods of six months, were now let from month to month.⁵ Laing's description in 1842,⁶ and Babbage's in 1846,⁷ bear out, in general terms, the ideas we have already set forth; but in 1875, although shafts were sunk, and levels driven, at tut, with the 'takes' usually for one or two months, the ore itself was excavated, often by tribute, but sometimes by tut, and the significant remark is added that 'tributing of late had gone much out of use.'

These statements receive confirmation at still earlier dates. The *Mining Journal* in 1836⁸ states that 'latterly, in some mines, the contrary practice (to setting pitches on tribute) has prevailed, and the lode is stoped at so much per fathom,' although it is said such practices were then rare. John Taylor in 1814 describes tut

work as used in shafts, levels, and in stoping ground,⁹ and it will be recalled that Pryce states that in some mines the adventurers set the tin to break by the fathom.¹⁰ At the time of the commission on mines, the amount of work let upon tribute was decreasing,¹¹ and the commissioners themselves state in their report that, in the event of a rich lode being discovered it is frequently worked by tut. One witness stated that in consequence of the 'starts' (a piece of unexpected good fortune in the yield of a lode) mine agents had grown cautious, and, instead of setting the workers to tribute, paid them a certain amount per ton of what was fit for stamping, when brought to the surface.¹² Evidence to a similar effect was given before a committee of the House of Commons in 1887.¹³ Captain Bishop, for example, the manager of the East Pool Mine, affirmed that there were, at present, no tributers there,¹⁴ and a working miner alleged that tut work was by far the most extensive system,¹⁵ while another declared that tribute was growing less all the time, and now was seldom practised.¹⁶

The facts, then, thrown into prominence by our review of the history of the system of wages in the Cornish mines, are the encroachment of tut work upon tribute, and the diminution of the intervals at which the payment of wages is made. The coincidence can scarcely be termed accidental. The avoidance of irregularity of earnings, has hardly been possible without a decrease in responsibility and independence, and this decrease has implied greater frequency in the payment of wages.

It is not difficult to see why matters have been drifting in this direction. Under the system of tribute, the miners' earnings are apt to be irregular. Should a lode turn out poorer than expected, a tributer may work for weeks without earning a penny,¹⁷ a fact which Pryce had noted in 1778.¹⁸ Added to this, we have to reckon with a growth of knowledge on the part of mine-captains. Metallic mining is no longer haphazard, and the mine-officers can now estimate the probable yield of a lode so closely, that the element of speculation in the tribute bargain, which, after all has always been its chief *raison d'être*, is now reduced to a minimum.

¹ Stat. 6 & 7 Will. IV, c. 106.

² See *The Tinnerns' Grievance* (1697), and a pamphlet on the tin duties (1833). The abolition of the coinage duty in 1837, and its replacement by a small royalty, removed all excuse for any further exemption from ordinary rates.

³ *Cornish Mining*, 32. To-day, the lord's dues amount to about one-twentieth of the ores raised—plus rental and damages. The leases are oppressive, not only because of the exacting terms above described, but also since they prescribe so minutely the disposition of the black tin that it would be difficult for a leaseholder to smelt his own tin.

⁴ 'West Barbary,' by L. L. Price, *Journ. Roy. Statist. Soc.* li, 519.

⁵ *Ibid.* 520.

⁶ Laing, *National Distress*, i, 66.

⁷ Babbage, *Economy of Machinery and Manufactures*, (ed. 4), § 307.

⁸ 3 Sept. 1836.

⁹ 'West Barbary,' by L. L. Price, *Journ. Roy. Statist. Soc.* li, 522.

¹⁰ Pryce, *Mineralogia Cornubiensis*, 192.

¹¹ 'West Barbary,' by L. L. Price, *Journ. Roy. Statist. Soc.* li, 522-523.

¹² *Ibid.* 523.

¹³ *Rep. on Stannary Act Amend. Bill* (1887), Q. 244, 313, 1301, 1338, 1477-81, 1324-26.

¹⁴ *Ibid.* Q. 1910.

¹⁵ *Ibid.* Q. 1980, 1981, 2222, 2223.

¹⁶ *Ibid.* Q. 2372, 2373.

¹⁷ 'West Barbary,' by L. L. Price, *Journ. Roy. Statist. Soc.* li, 560.

¹⁸ Pryce, *Mineralogia Cornubiensis*, 192.

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Before closing we have to consider what is perhaps the most noteworthy feature of Cornish tin mining at present, namely, the relations between tinner and smelter. Originally, as stated, the miner smelted his own ores, but blowing-houses, when established, became separate ventures, the owners fusing the miners' tin for a percentage of the product,¹ the smelter having bargained for the parcel brought him, and given his note to deliver the quantity of white tin agreed upon at the ensuing coinage.² These notes, which were transferable by endorsement,³ the tanners, being usually in want of ready money, sold to the merchant dealers, as we have already seen. In the eighteenth century, however, came a change, the merchant dealers giving place to the smelters, who, from that day, have acted as financiers of the stannaries. At first, the smelters simply bought back, at a discount, their notes from the tin owners,⁴ and as long as the coinage system continued this system of indirect purchase was bound to continue; for to buy an article of fluctuating price, which could not be sold save at periodical coinages, would have been too speculative a business for the smelter to undertake. To the tinner it obviously made no difference where he took his ore, inasmuch as all the smelters made similar assays and charged the same toll.⁵ Since the abolition of the coinage, the smelters have laid aside their former methods and bought the ore from the mine owner direct.

To understand how heavily this bears upon the mines, it will be necessary to examine more closely into the conditions under which the ore is sold. Of these, the chief is known as the Tin Standard. This is an amount paid by the smelter per hundredweight of metal contained in the ore, as calculated from a dry assay, after the deduction of one and one-fourth from the product for every twenty for returning charges.⁶ By an old custom there is also a deduction on the weight of the parcel of tin ore of three pounds per hundredweight, and it is customary also to reckon the price by the nearest eighth of a pound above or below the calculated price.

These provisions are anything but fair. The smelter buys, not on actual contents of the ore, but on the contents he assumes he will recover by the process of smelting. The difference between that and the wet assay, which gives the actual contents of the ore, is variously stated at from five to ten per cent. in favour of the latter, but as we have to deal with commercial values that consideration may for the present be dismissed, by taking it for granted that the smelter

loses such a percentage in the process of smelting, and is therefore entitled to this allowance.⁷

But this is not all which the smelter claims, for since the standard is the price which he pays for the metallic contents of the ore, it follows that the difference between such a price and that at which he sells (the market value) represents gross profits.

A second consideration is the 'returning charges,' or the assumed cost of smelting, deducted in mineral from each batch of black tin sold by the miner. To be fair the charges for smelting should be upon a cash basis, varying solely with the rise or fall in the cost of labour, fuel and fluxes. As it is in kind, the higher the price of black tin the higher the price which the miner must pay the smelter.⁸ Thus the miners in the years of 1883 to 1900, paid a yearly average of forty per cent. over even what the smelters claimed as their actual cost,⁹ and the returning charge which, according to the standard, the miner believes to be only six and one-fourth per cent., because it is one and one-fourth per cent. of twenty, is on an average quality of black tin really ten per cent.⁹

By 'draftage,' another trade custom, the smelter is allowed three pounds per hundred-weight on every parcel of black tin he buys. At its inception this was given for 'the turn of the scale' on all the black tin purchased by the smelter, on condition that he allowed the same draftage on all the white tin he delivered. In the days of barter, pure and simple, the arrangement was perfectly equitable, but with the passing of the coinage dues the smelter, who might reasonably have been expected either to abolish draftage in its entirety or retain it so, continued to enforce the clause so far as receiving it from the miner was concerned, while he waived it in his delivery of white tin. It can easily be figured that the miner, under the draftage allowance, has to turn over to the smelter the rough equivalent of five per cent. in cash on his gross turnover, while the smelter will have the assurance that, even at the worst of times, the allowance is not likely to be worth less than forty-four per cent. on his working costs (as it was in 1896), and, with a good price for tin, it may be worth ninety-three, as it was in 1900.¹⁰ The smelter is sure of a handsome profit, therefore, even when the miner works at a loss.

The actual loss of metal in the smelting of the tin has never been accurately determined;¹¹ but, in any case, it is a question for which the

¹ Add. MS. 6682, fol. 297.

² Borlase, *Natural Hist. of Cornwall*, 181.

³ Pryce, *Mineralogia Cornubiensis*, 292.

⁴ Ibid. 292, 293.

⁵ 'The System of Selling Tin Ore in Cornwall,' *Salmon's Mining and Smelting Magazine*, v, 6-8.

⁶ *Cornish Mining*, 16.

⁷ *Cornish Mining*, 16.

⁸ Ibid. 16. Four pounds sterling per ton of metal would be a liberal estimate of the cost of smelting, yet, since 1883, only once has the smelter received less, while, on an average, he received almost fifty per cent. more.

⁹ *Cornish Mining*, 17.

¹⁰ Ibid. 18.

¹¹ Ibid. 20.

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smelter can hardly claim serious consideration, since he buys his black tin on the dry assay, not on the actual metal contents, but on the assumed contents which he will recover by his method of smelting. As, therefore, by his conditions of purchase he has already safe-guarded himself by securing an allowance equal to his probable loss in smelting, he can hardly ask for further consideration. Moreover, as he sells his 'ashes' at prices based on their tin contents, he is actually reimbursed for at least a portion of the loss in smelting, which the miner has already allowed him in full and in kind.¹

The relations between tinner and smelter are a result largely of the apathy of the Cornish mining companies and their slowness to grasp the ordinary principles of business management. At present, however, it would be difficult, in the face of organized opposition on the part of the smelting monopoly, as well as the existence of

the present system of leases, under which the tinner is usually debarred from smelting his own tin, to bring about the much needed consolidation of mixing and smelting. Yet, until this takes place, and more chance for profit is given the tinner, it is hard to see much hope for the tin mines of Cornwall. Since the early seventies the discovery of vast and easily worked deposits of stream tin in Australia and Tasmania, to say nothing of a huge increase in the output of the East Indies, have depressed prices so far that although the Cornish lodes are still rich, most of the mines have been forced to close. The present output of about 8,000 tons comes almost entirely from a half-dozen large mines, headed by Dolcoath, while the scores of abandoned shafts which dot the tin districts point to the fact that a land which once supplied the world with tin, is for the time, at least, hopelessly superseded.

COPPER MINING

The copper deposits of Cornwall present no such features of historical and economic interest as do the stannaries. Occurring only in lodes, and comparatively deep at a level, they were late in being developed, and in consequence carried for their miners no charters of privilege or codes of mining law, unless we except the fact that in 1837 copper mining in Cornwall and Devon was brought under the operation of the then modified stannary laws and courts.²

No trace is to be found of mines or of mining tools³ among the cupriferous rocks of Cornwall which would lead one to believe in the fact of their having been worked at a period before or contemporaneous with the Romans,⁴ although the latter erected several brass foundries in Britain,⁵ and probably were acquainted with the copper of Keswick and Anglesey.⁶ During the Middle Ages a more or less desultory quest for the metal was carried on in England, but mainly in other counties. Several documents of the period of Henry III refer to the discovery of gold and copper mines in Devon, and the king's claim upon them as mines royal,⁷ while the same

county figures in a grant of the sole rights of gold, silver, and copper mines, issued by Edward III.⁸ At the same time there is evidence that copper was worked in the Keswick district in Cumberland.⁹ The total amount raised from these several sources must always have been scanty, inasmuch as during the reigns of Henry VIII and Edward VI Parliament prohibited the export of brass and copper, the reason given being the small quantity produced.¹⁰

With the Elizabethan period came a revival of mining pursuits, and in particular the re-working of the Newlands and Keswick lodes by the newly incorporated Company of the Mines Royal.¹¹ Yet it cannot be doubted that most of the copper of this period was imported, and even at a much later date the British yield appears to have been small, as is shown by a memorial to the House of Commons, presented by the brass manufacturers, to the effect that 'England, by reason of the inexhaustible plenty of calamine (not of copper), might become the staple of the brass manufactory, for itself and foreign parts, and that the continuing of the brass works in England would occasion plenty of rough copper to be brought in.'¹²

No records exist of the production of copper in Cornwall until the latter part of the sixteenth century. Camden in 1580, had ventured the

⁸ Pat. 32 Edw. III, m. 4.

⁹ Phillips and Darlington, *Records of Mining and Metallurgy*, 19.

¹⁰ Stat. 21 Hen. VIII, c. 10; 33 Hen. VIII, c. 7; 2 & 3 Edw. VI, c. 37.

¹¹ S. P. Dom. Eliz. xx, 103; xxxvii, 34; cclxxv, 145.

¹² Printed in Moses Stringer, *Opera Mineralia Explicata*, 156, 157.

² Statutes 6 & 7 Will. IV, c. 106.

³ 'Copper Mining in Cornwall,' by Jos. Carne, *Trans. of Royal Geol. Soc. Cornw.* ii, 37.

⁴ 'Antiquity of Mining in the West of England,' by R. N. Worth, *Journ. Plymouth Inst.* v, 127; Caesar, *De Bello Gallico*, bk. v, c. 12.

⁵ Borlase, *Antiquities of Cornwall*, bk. iii, c. 15.

⁶ Pennant, *A Tour in Wales*, iii, 59.

⁷ Pat. 47 Hen. III, m. 12; Close, 47 Hen. III, m. 15.

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erroneous¹ statement that veins of copper and lead were to be seen on the rocky cliffs of Land's End at low water,² and later, we learn from a document among Elizabeth's state papers,³ that several copper mines were operated in the St. Just district. These may have been the same works mentioned a year or two earlier by Ulricke Frosse, a German metallurgist, who had been connected with the mines at Keswick, and who was, in 1585, overseer of the mineral works at Perranzabuloe. He is represented at the latter place as smelting twenty-four hundredweight of copper ore per day in each furnace, with the assistance of skilled German workmen from Cumberland.⁴ In one of his letters, Frosse refers to a copper mine in Cornwall from seventeen to twenty fathoms in depth.⁵ From what evidence is available it seems that the copper lodes were regarded by the crown as in the nature of mines royal, as we find occasional references to the appointment of a royal surveyor to overlook operations,⁶ while James I included the Cornish mines in a grant of a fifteenth of all copper works in a considerable array of counties.⁷

In spite of the evidence that Cornwall's copper deposits shared the general movement toward industrial exploitation in the sixteenth century, it may be stated as almost certain that the mines referred to did not continue long in operation. In no part of the county has copper ever been found at the surface; in fact, the lodes, as a general rule, lie deeper even than those of tin,⁸ and at a time when the difficulties of drainage, as shown by the history of tin mining, were at a maximum, it is not easy to see how much copper could have been raised.⁹

This is probably the reason why so little is said upon the subject in most of the early local histories. Next in point of time after Camden's account, comes that of Norden, who states that at the time of his writing, copper abounded in the Duchy in great quantities,¹⁰ and in an address to James I at the end of the book, he informs the king that 'it is a metall whose qualitie and quantitie would so farre exceede the former (tin) as, were the workes assumed into Your Majestie's own handes, duly searched, trulie managed, and effectually followed, would rayse a greater yearlie profite than the value of Your Majestie's land revenues, so riche are the workes, especially some

lately founde, as by the opinion of the skilful in that misterie the like have not been elsewhere founde.' In almost all of his particulars, however, Norden is incorrect. In the first place, he says that there is much copper about Morvale, 'Sener,' and 'Lalante,'¹¹ and, in another part, says that Sener is a parish upon the North Sea, where there are rich copper mines.¹² Of Lalante, he says, there are there great stores of tin and copper.¹³ These statements could not possibly have been true. In Morvale, copper is hardly known, and no veins there have yielded metal in any former period.¹⁴ In Zennor, copper has never been discovered save in slight amounts, and it is almost equally rare in Lelant. Furthermore, in neither parish is there any trace of old works save for tin.¹⁵ Menege in Kerrier, says Norden, is a fruitful place for tin and copper.¹⁶ Yet tin has never been found there, and there are no remains to be seen of ancient tin works. Some small bunches of copper exist, but no ordinary metallic veins.¹⁶

Carew's information is brief. 'Copper,' he says, 'is found in sundry places, but with what gain to the searcher I have not been curious to enquire, nor they hasty to reveal, for at one mine (of which I took a view), the ore was shipped to be refined in Wales.'¹⁷

These accounts show that copper ore was produced in Cornwall at that period, and that a few individuals (probably foreigners) were acquainted with its value, and profited by their knowledge. But it cannot be doubted that at a much later time the Cornish miners in general knew little of the nature and value of copper ore, as it is well known that in the latter part of the seventeenth century it was in several cases sold, under the name of 'poder,' for small sums,¹⁸ while most of the tin used in Britain came from Sweden, Germany, Spain, and the Barbary States.¹⁹ Upon the whole, it is probable that before, approximately, the year 1700, the copper ores of Cornwall were chiefly, or wholly from tin mines, or, at least, from mines originally wrought for tin, and, although it is not true that it was not until the close of the seventeenth century that copper ore was first discovered in Cornwall, as was stated to a committee of the House of Commons in 1799,²⁰ yet that seems to have been the period when mines were first set to work purposely for

¹ 'Copper Mining in Cornwall,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 41.

² William Camden, *Britannia* (Gough's ed. of 1789), i, 3.

³ S. P. Dom. Eliz. cxcv, 39.

⁴ Documents printed in Grant Francis, *The Smelting of Copper in the Swansea District*, 5, 23, 24.

⁵ Ibid. 10.

⁶ S. P. Dom. Jas. I, lxvi, 47.

⁷ Ibid. xxii, 51.

⁸ Pryce, *Mineralogia Cornubiensis*, Introd. p. viii.

⁹ S. P. Dom. Chas. I, clxxiv, 1.

¹⁰ Norden, *Speculi Britanniae Pars.* (ed. 1728), p. 17.

¹¹ Ibid. 40.

¹² Ibid. 41.

¹³ Ibid. 42.

¹⁴ 'Copper Mining in Cornwall,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 42.

¹⁵ Norden, *Speculi Britanniae Pars.* (ed. 1728), p. 49.

¹⁶ 'Copper Mining in Cornwall,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 43.

¹⁷ Carew, *Survey of Cornwall* (ed. 1811), 21.

¹⁸ Borlase, *Natural Hist. of Cornwall*, 205.

¹⁹ Houghton, *Collection for the Improvement of Husbandry and Trade*, 18 June, 1697.

²⁰ 'Testimony of Thomas Williams, M.P.,' printed in Robert Hunt, *British Mining*, 106.

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copper. This statement is corroborated by the fact that, although a charter for making brass was granted as early as 1565,¹ Tonkin does not fix the date of the discovery of the value of copper ore earlier than 1679,² and it was not until 1691 that a charter was granted to Sir Joseph Hearne and others, for refining and purifying copper, under the name of Governor and Company of the Copper Mines of England.³ Another circumstance favouring the same conclusion is that the copper currency of Great Britain was not coined from British metal until 1717.⁴ The new industry, however, was encouraged by the repeal of the old prohibition of the exportation of copper,⁵ and active operations made at once considerable headway.

Pryce was familiar with a Cornish memorial dated about the year 1730, which prays that facilities be given for the importation of coals on account of the distressed state of the mines, and the necessity for deepening them. The existence, therefore, of Cornish copper mines seems at that time to have depended upon the application of the new power brought in by steam, and it is evident that the discovery of the power of the steam engine in drawing water was almost coincident with the rise of copper mines on a great scale, and that its history is parallel with that of the mines themselves throughout their course.

During this period we meet for the first time with records of the sale of copper ore in Cornwall. According to Pryce a yearly average of 6,480 tons of ore was sold from 1726 to 1735; 7,552 tons from 1736 to 1745; 9,879 tons from 1746 to 1755; 16,970 tons from 1756 to 1765; and 26,427 tons from 1766 to 1775.⁶ In 1786, 39,895 tons of ore were mined, and in 1796 43,313 tons, producing 4,950 tons of pure copper.⁷ The first successful copper mines were those of Blanchland in Kea, belonging to the earl of Falmouth,⁸ but in early years the most productive were Poldice (which, according to Hals, employed for forty years from 800 to 1,000 men), Huel Fortune in Ludgvan, Roskear in Camborne, Pool Adit in Illogan, and Huel Virgin in Gwennap.⁹ The greatest and most sudden gain ever heard of is said to have been in Huel Virgin during July and August, 1757. In the first fortnight £5,700 worth of ore was extracted, and in the next three weeks and two days £9,600 worth.⁹ In 1758 the best

producing mines were those of Chacewater in Kenwyn, North Downs in Redruth, Huelros in St. Agnes, Dolcoath, Bullen Garden, Roskear, Huel Kitty, Entral, and Longclose in Camborne, Huel Fortune in Ludgvan, Pool in Illogan, Metal Works and Trejenvivian in Gwennap, Binner Downs and Clowance Downs in Crowan, Huel Cock and Rosmorán in St. Just, and Herland in Gwinnear.¹⁰ The close of the eighteenth century saw forty-five copper mines in Cornwall, of which eleven were in the Gwennap district, six in St. Agnes, five in Camborne, four in Gwinnear, four in St. Hilary, three each in Germoe, Crowan, and Illogan, two in St. Neol, and the rest scattered. Besides these were eighteen mines of copper and tin, one in Gwinnear for copper and silver, and one in Camborne for copper and cobalt.¹¹

To attempt a description of the various improvements which were introduced into the sinking of copper mines would be to duplicate in great measure what is given under the heading 'tin,' and the more so as it is a well-known fact that many of the best copper mines have produced tin as well, the ores usually coming in regular alternation. As copper mining on any scale did not begin in Cornwall until the eighteenth century, the mines at once obtained the benefit of the steam engine for draining the levels and hoisting the ore,¹² blasting powder for smashing the rocks, as well as a host of other improvements elsewhere enumerated. Most of them were, at an early period, comparatively deep. One hundred fathoms seems to have been considered the necessary minimum at the time when Pryce wrote,¹³ while, thirty years later, in 1808, Crenver and Oalfield mines had reached 200, Cook's Kitchen 210, and Dolcoath 228 fathoms.¹⁴

From the massive character of the copper ores it is probable that, in the early days of mining, little or no dressing took place, the ores of less homogeneous nature being rejected. Hence, in all probability, arose those traditions of waste which are, in this sense, confirmed by the fact that hedges have been torn down in the nineteenth century for the sake of the stones of copper ore built up in them.¹⁵ No earlier record exists of the processes of copper dressing in Cornwall than that given by Borlase; and as he could not have spoken to the fact from his own personal knowledge, it seems not unlikely

¹ Moses Stringer, *Opera Mineralia Explicata*, p. iii.

² Carew, *Survey of Cornwall* (ed. 1811), p. 21, note.

³ 'Copper Mining in Cornwall,' by Jos. Carne, *Trans. Roy. Geol. Soc. Cornw.* iii, 44.

⁴ 'Statistics of the Copper Mines of Cornwall,' by Sir Chas. Lemon, *Journ. Roy. Statist. Soc.* i, 66.

⁵ Stat. 5 & 6 Will. and Mary, c. 16.

⁶ Pryce, *Mineralogia Cornubiensis*, Introd. p. xiv.

⁷ Lysons, *Magna Britannia* (ed. 1806-22), iii, p. ccviii.

⁸ Ibid. iii, p. ccvii. Polwhele, *Hist. of Cornwall*, bk. 4, p. 134.

⁹ Lysons, *Magna Britannia* (ed. 1806-22), iii, p. ccviii.

¹⁰ Polwhele, *Hist. of Cornwall*, bk. 4, p. 134.

¹¹ Lysons, *Magna Britannia* (ed. 1806-22), iii, p. ccviii.

¹² 'Statistics of the Copper Mines in Cornwall,' by Sir Chas. Lemon, *Journ. Roy. Statist. Soc.* i, 68.

¹³ Pryce, *Mineralogia Cornubiensis* (1778), Introd. p. viii.

¹⁴ Polwhele, *Hist. of Cornwall*, bk. 4, p. 134.

¹⁵ R. N. Worth, *Historical Notes Concerning the Origin and Progress of Mining Skill in Cornw. and Devon*, 43.

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that his account nearly represents the indebtedness of the county to the smelter Costar, of whom he speaks so highly. According to Borlase,¹ the ore was either spalled (broken with hammers), or bucked (bruised upon a rock with a bar of iron), and then re-sorted. The best part was washed and sifted into a tub through a griddle of inch-square meshes. Of this, the finer portion was jigged in water in another and smaller sieve, while the 'dredged ore' was washed and picked, and the poorer part stamped, as was the case with tin, the crushed stones passing as usual from the stamp coffer to several pits, where it was distributed in accordance with its specific gravity. The heavier part remaining nearest the stamps was then jigged (a process brought in from the Derbyshire lead mines),³ and the rest trunked, buddled, and tossed.³

Pryce, in 1778, writes in much the same strain, but goes into wider detail. The dressing of copper ore, he says, cannot be according to one uniform method.⁴ The hard and poor ores require much bruising and roasting before being clean, but the better grades are easier to operate.⁵ The manner of dressing and cleansing is much like that for tin, but as good copper is usually dug and raised in large masses, as little as possible mixed with other matter, a great part of it is solid ore, and requires no washing. When it comes to the surface they sort out the big stones from the small and break them, throwing aside the poorer part, which is afterward to be straked and washed. But when the ore rises plentifully, and with little waste, it may be perhaps a loss to wash it, and therefore if it comes moderately dry a person near the shaft where it rises sifts it on a griddle or iron wire sieve.⁵ The part that runs through, if not clean enough for sale, is washed, and it is seldom that griddled or small ore is so pure and clean as not to require this. The poorer and smaller part is usually carried to the strakes, sometimes after being griddled, but more often before, and as it comes from the mine.⁵

This strake is made of two boards laid flat for a bottom, fourteen inches in the ground, on an inclined plane, with two sides formed of one deal board each, resembling a narrow, shallow chest without a cover. In it runs a rapid stream. One man throws the foul ore into the strake while another moves and tosses it with a shovel in the stream, and thus the slime, or finer ore, is carried by the water into a pit just below, and the stony, coarse, poor parts settling largely on the lower end of the boards are, at times, divided and cast aside to be stamped.⁶ The better ore,

by its gravity, is deposited at the head of the strake. But if it contains much pure mundic this settles also at the head of the stream because of its weight, and is separated and laid by itself. Moreover, the largest stones, either of ore or of waste, which, by the motion of the shovel, rise uppermost, the dresser throws on one side and women and children pick the good stones from the bad. The rest is laid by to be bucked smaller with flat iron hammers, if the ore is worth it, otherwise it is taken to the stamps. The picked ore, which is rich, is given to girls called cobbors to break on big stones with hammers, after which it goes by the name of cobbed ore. It requires no water or further dressing, being fit to mix at once for sale.

The stony ore being left by the pickers (dredge ore) is carried to the bucking-mill, which is something like a wooden coalscuttle placed on a low hedge, with a hard stone at its lower end, whereon a strong wench with a hammer breaks the ore to the size of small beans. Then it goes to the vat or kieve and is jigged. They fill the kieve half full of water, on the surface of which the jigger holds a coarse wire sieve into which another man throws the unclean ore. The jigger dips it into the water and shakes it there several times until the smaller part falls through to the bottom of the kieve. What remains in the sieve he reserves by itself until there is a quantity. This coarser size made by the sieve is jigged pure and clean if it be well given for ore. If not it is picked and the refuse bucked over again pursuant to its richness or poverty, and the dresser's direction and judgment.⁷ When the kieve is almost full they pour off the water and take out the small ore, which, perhaps, they sort again after the same measure in sieves with smaller holes. Being thus divided they dress each sort apart in kieves half full of water with the proper sieves, whose holes are small enough to keep the ore from running through. The jigger has a peculiar movement which he gives the sieve, which causes the light waste to rise uppermost in it, and after that the ore, and then, at the bottom, the heavy mundic. To separate these, he takes a small semi-circular piece of wood, called the limp, with which he skims or rakes off the light refuse to be re-jigged, and then the ore, which he places by for sale, leaving the mundic to be jigged once more.⁷ The light refuse of the ore is frequently straked again. The slimy fine ore which falls through the fine sieve to the bottom of the kieve is often cleansed by the tye (which is the same as the strake, but with a very slow and small stream of water), or by buddling or framing like tin ore, and, also, by jigging in a small close sieve.⁷ Another method of dressing very fine and delicate copper and lead ores—much speedier than bucking them—is to give them over to dry stamps.⁸

¹ Borlase, *Natural History of Cornwall*, 203.

² Pryce, *Mineralogia Cornubiensis*, 243.

³ Borlase's account is substantiated by an eighteenth-century document of slightly later date. Add. MS. 6682, fol. 302-303.

⁴ Pryce, *Mineralogia Cornubiensis*, 236-238.

⁵ Ibid. 233.

⁶ Ibid. 234.

⁷ Ibid. 235.

⁸ Ibid. 244.

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Having finally passed into the hands of the smelter, the ore is reduced to metal, says Pryce, in furnaces of four sorts, the calciner, the operation, the roaster, and the refiner.¹ In the calciner, which is reverberatory, the ore is stirred about for twelve hours in such a fire as will not melt it. From two to five hundredweight is then put with from five to two hundredweight of raw ore into an operation furnace, and submitted to an intense heat. The slag is skimmed off, and another like quantity of ore inserted, and finally the molten copper is run into pigs.² These last are plunged into cold water, and then carried to a horse-mill and ground to powder, or, as in some places, bucked or broken by women, girls, and boys. The copper is then carried to a furnace called a metal calciner, spread upon the bottom and calcined again,³ then drawn out, cooled by water, and carried to the metal furnace, where it is melted, skimmed, and run into pigs. It then goes to the roasting furnace for sixteen or eighteen hours, where it is melted and skimmed as before, and this operation of roasting and skimming is repeated three or four times. From there it is taken to the coarse refining furnace, where it is melted, fluxed,⁴ skimmed, and put into moulds. Finally, it is sent to the refining furnace and melted and skimmed once more,⁵ after which it is ready for market. After every skimming the slag is treated in much the same fashion, and from it is extracted copper of inferior grades.³

The smelting of tin ore has always been done locally, in the county itself, but copper smelting never had a firm hold in Cornwall, and has long since left it. As early as the sixteenth century, Frosse, the German already mentioned in another connexion, had ascertained the fact that, by having at hand a variety of ores, a smelter might render an ore profitable that would otherwise be useless—in other words, that frequently copper can be extracted at less cost by smelting ores in a mixture than by smelting one ore by itself.⁶ Accordingly, although at first he seems to have smelted upon the spot small quantities from the works at Perranzabuloe, of which he was manager,⁶ we find him announcing, in 1584, that the ores would be transported out of Cornwall to Neath, in Wales,⁷ where a few years later Carew suggests that all Cornish copper was taken.⁸ Had the mines been continued throughout the seventeenth century, it is probable that the advantages which Wales possessed, in having a plentiful supply of cheap

fuel, and in being the centre for copper smelting for other districts, would have thenceforth attracted all Cornish ores. The mines, however, were discontinued throughout this period, and when they were revived the old traditions of a Welsh smelting had apparently been forgotten.

First to discover the value of the ores were a few Bristol gentlemen in 1690, who, buying them at the low price of from £2 10s. to £4 per ton, reaped a considerable profit from their refining operations.⁹ Their success having called in other dealers from the same city, about the year 1718¹⁰ an agreement was reached by which the mine owners consented to sell all their copper for a term of years at prices which, although as a rule low, varied considerably with the quality of stock raised from mine to mine. Matters continued thus for about ten years.¹⁰ The huge quantities of copper ore raised in the Huel Fortune, Roskear, and Pool Adit mines were disposed of to the Bristol men, who, confederated into the four companies—the Brass Wire Company, the English Copper Company, Wayne and Company, and Chambers and Company¹⁰—enjoyed a complete monopoly of purchase, and took the ore at practically their own price.¹⁰

Just at this moment, however, Thomas Costar, a Welsh smelter, visited Cornwall for the purpose of improving his business in the same way. Fourteen hundred tons of ore, which for some years had been lying unsold at Roskear and Huel Kitty, were offered him, for which the confederated smelters had been ready to give only £4 5s. per ton.¹⁰ The Welshman took it at £6 5s., ready money, and yet so comparatively low was even this price, that he gained 30 per cent. by the transaction. He bought 900 tons more in Roskear, at £7 per ton, and in less than six months before leaving Cornwall had purchased 3,000 tons, and on them realized a profit of 40 per cent.¹⁰ From that day the smelting works at Bristol declined, and the Welsh companies at Swansea secured almost the entire Cornish yield.¹¹

A few attempts had been made to smelt the copper in Cornwall itself. 'Seventy years ago,' wrote Pryce in 1778, 'Mr. Scobell, at St. Austell, was joined by Sir Talbot Clarke and Mr. Vincent, and there was smelted the first piece of copper in Cornwall.¹² After this, John Pollard, of Redruth, and Thomas Worth, of St. Ives, made a second trial, but both these attempts failed, more by reason of the knavery of workmen, ill-management, and the improper situation of the works, than any great cost of fuel.' After these had failed, Gideon Collier, of Perranzabuloe, erected a smelting-house in Phillack, and

¹ Pryce, *Mineralogia Cornubiensis*, 272.

² Ibid. 274.

³ Ibid. 275.

⁴ Ibid. 262–263.

⁵ Grant Francis, *The Smelting of Copper in the Swansea District*, 23.

⁶ Ibid. 5, 23, 24.

⁷ Ibid. 24.

⁸ Carew, *Survey of Cornwall* (ed. 1811), 21.

⁹ Pryce, *Mineralogia Cornubiensis*, 277, 286.

¹⁰ Ibid. 287.

¹¹ Ibid. 277.

¹² Ibid. 278. Carew, *Survey of Cornwall* (ed. 1811), 22 note.

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at his death the work was carried on by Sir William Pendarves and Robert Corker for some years, but after their decease the business was abandoned.¹ In Lenobrey, in St. Agnes, a small beginning was also made, which failed for lack of capital.¹ To prevent this passing of copper ore out of Cornwall, a proposal was made to some of the chief gentlemen of the county, to petition Queen Anne to have the copper mines subjected to the laws of the stannaries in all respects save being under bounds, and to have the copper stamped, like tin, at the proper towns under payment of a duty—a proceeding which would have made it necessary to smelt the ores in the county.² Fortunately for Cornwall, the sudden death of the queen occurring at this juncture, the insane proposal to burden the growing industry with trammels which the tinnors were trying in vain to throw off, was never consummated. In 1754, one Sampson Swayne and a few gentlemen of Camborne erected smelting works at Entral, in Camborne parish, but their situation was too far removed from the coal centres, and so they removed to Hayle.³ In 1770 another company erected works at Redruth, but later removed to Tregew,⁴ where after continuing in business for some years they were obliged to shut down.⁵ The Hayle company succeeded in surviving the opposition of the Welsh operators,⁶ and in 1820 was smelting 6,000 tons of ore per annum.⁶ It closed only in 1832.⁶

Friendly relations between the smelters and the mine owners have been maintained for at least a century and a half⁷ by the so-called ticketing system of ore purchase. Mr. Pryce writes :—

‘When dressed and made saleable, the piles of ore are either kept separate for a market, if the quantities are large, or else the different sorts are well mixed together in one pile, very rarely exceeding 180 or 200 tons in a single parcel, and from thence down to 100, 80, 60, 50, 40, 20, 10, 5, or even 1 per parcel, if the seller pleases, which is seldom the case, and never for his advantage.⁸ A dressed parcel of ore, before the day of sampling, is well mixed by several men, who turn it over and over again with shovels. The parcel, if less than 10 tons, is divided in 3 doles or piles, and if over 10 tons, 4 doles; if ever so many more than 19 tons, 6 doles, and then it is at last ready to be sampled.

‘The samplers (who are agents of the smelters) meet at the spot according to appointment, and fix on the third, fourth, or sixth dole of a parcel, according as it is great or small, to take their samples from. The miners then cut or part that dole athwart and across, down to the ground, so that it is divided into quarters by these channels. Then the sampler, with a shovel, pares down a little of the ore from all parts of the channels, to take as equal and regular a sample throughout the whole as he can, to the amount of 200 or 300 pounds.⁹ This he carries to a clean floor, and mixes it into a heap by itself, which heap he also cuts into quarters and mixes and quarters again, until he finally gets a small quantity, which, when sifted through a small coarse sieve, he mixes several times, and so quarters and remixes as before, till it is reduced to a small heap. At last he puts a pound or two in a bag,¹⁰

which he carries away with him to be assayed in one of several ways.¹¹

On the basis of his assays, a smelter will make his offer for the ores of different works. The standard of copper, a phrase which one invariably hears used in connexion with ticketing, denotes the price of a ton of metal in the ore, from which standard the smelter deducts £2 10s. per ton, or as much as may be required, according to its richness, to produce a ton of copper, a sum which the smelter considers an equivalent for his expenses.¹² A fortnight after the assaying comes the ticketing, during which interval the smelters’ agents receive answers from their principals as to the price they are to offer. The tickets containing the offers from the different companies are produced, founded upon the assays they have made, and the company making the highest offer receives the ore.

The internal arrangements of the Cornish copper mines have differed little, if at all, from those of the tin mines. In both we find examples of the familiar cost-book system,¹³ and in both the workmen were, and are, either tribute, tut, or day men, the tributer leasing a pitch, or part of a mine, with perhaps one or two partners, excavating, raising, and dressing the ore at his own expense, and receiving as reward a certain percentage of the proceeds,¹⁴ the tut worker contracting, at a certain rate, for the sinking of shafts and winzes and the driving of levels, and the day labourer employed mainly above ground about the engines, or else concerned with the dressing of the ores. The dressers of copper ore sometimes worked for a monthly wage in Pryce’s time, or at a fixed rate per ton of prepared ore. But these arrangements making it

¹ Pryce, *Mineralogia Cornubiensis*, 287.

² Ibid. 279, citing the Tonkin MS.

³ Ibid. 279.

⁴ Ibid. 280.

⁵ Lysons, *Magna Britannia*, iii, p. ccix. Polwhele, *History of Cornwall*, bk. 4, 137.

⁶ Worth, *Historical Notes on the Origin and Progress of Mining Skill in Devon and Cornw.* 51.

⁷ Pryce, *Mineralogia Cornubiensis*, 287. Add. MS. 6682, fol. 303.

⁸ Pryce, *Mineralogia Cornubiensis*, 244–245.

⁹ Pryce, *Mineralogia Cornubiensis*, 245.

¹⁰ Ibid. 246.

¹¹ Ibid. 264.

¹² Watson, *Compendium of British Mining*, 19.

¹³ Such seems to be Pryce’s meaning. *Mineralogia Cornubiensis*, 188.

¹⁴ Pryce, *Mineralogia Cornubiensis*, 188.

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to the dressers' interest either to be lazy, or to be hurried and slipshod in their work, the favourite way was to set the ore to dress in proportion to the price it brought at the smelter's.¹

In the stannaries the tributer paid the landlord, bounder, and adventurers their respective dues in piles of tin-stone ready for the stamps, and retained the residue. In the copper mines the tributer excavated, raised, and prepared the ore for smelting at his own expense. It was then given over to the adventurers, who disposed of it at the ticketing, and from the cash proceeds paid the workmen according to the rate previously agreed.² Another anomaly is exemplified by the system of private sampling described by Pryce.

'The takers of tribute pitches in copper are also obliged to mix their ores with those of other pitches, or with the owners' ores, and to sample them according to the will and discretion of the captains, otherwise the parcels of ore would be small, where there may be twenty pitches on tribute in one mine. Before the parcels are mixed together, they take from each a fair sample. The assay master, who buys at the public ticketing or sale a mixed parcel of ore, has these private samples given him, which he assays for 2s. 6d. each, with all the judgment and dexterity he is capable of, to make the most of each, and it is a very rare thing for any complaint to arise, so expert are they in their business.'³

'The use of private samples is this. Although the sundry parcels of ore mixed for sale may appear nearly of one value at sight, yet it must necessarily follow that some difference will arise from the different management in the dressing and other incidental causes. In a mixed parcel of 50 tons A may have 20 of £15 per ton, B 25 of £14 10s., and C 5 of £16 per ton, according to private samples, yet the gross 50 tons may sell for £15 5s. per ton. Nevertheless the amount must be divided among the tributers according to the selling price, subject to regulation by private samples; in other words, the excess or diminution for what it sells must be proportioned by the produce of the private samples, for if 50 tons sell at £15 5s., the amount is equal to £762 10s. Pursuant to the above private samples, A's 20 tons at £15 bring £300; B's 25 tons at £14 10s. bring £362 10s.; C's 5 tons at £16 bring £80, a total of £742 10s., or £20 short, by private sample. This is called a £20 increase.'⁴ The method of proportioning this among the tributers, says Pryce, is by the rule of three.⁵ 'It is evident,' he continues, 'that if the adventurers were to account to the tributers at the private prices, they would deprive them of £20, of which they ought to have their respective proportions, it being the absolute value for which the copper was sold. It is clear also that by mixing these

three parcels they have altogether brought a better price by £20 than if they had been sold separately.'⁶

As in the tin mines, the element of luck in taking pitches, resulting sometimes in leaving the workman half starved, the fact of the system being open to innumerable opportunities for crooked dealing on the part of the miners, and the consequences of the practice of auctioning the tut and tribute pitches to the lowest bidder, resulting too often in a fierce competition for work, which reduces the price paid the miner to a merely nominal sum,⁶ are combining gradually to make tribute working a phenomenon of the past.

Improvements in copper dressing in the century and a quarter since Pryce wrote, may be summed up in the statement that the various processes which the latter so thoroughly described have been simplified by the application of machinery. The first great improvement effected upon this basis was the substitution of crushing machines for bucking. The first crusher is said to have been erected at Dolcoath by Trevithick in 1804.⁷ Others were used in the Tavistock district about 1814,⁸ and in the course of a few years were introduced into all large concerns,⁹ under the name of halvan crushers. In every operation common to both, copper dressing has since advanced with that of tin. A distinctive feature in the nineteenth century has been the attention paid to the sizing of the stuff, effected by revolving riddles and sizing wheels, which greatly facilitates subsequent treatment.⁹

A further economy was effected by the process known as precipitation. Costar, early in the eighteenth century, had observed at Chacewater,⁹ that copper held in solution in mine water might be precipitated by means of iron. Precipitation was tried at Wheal Crofty, and although abandoned there, was introduced at Cronebane, Wicklow, under the superintendence of a Cornish mine captain.¹⁰ From Ireland it went to Cuba, and in 1854 from Cuba to Cornwall again, where it was applied to the waters of the Gwennap adit. Its practice at present has become uniform throughout the county.

The various vicissitudes which the copper mines have suffered since their establishment on a sound basis by the smelting arrangements made with the Swansea companies, have been due not so much to the exhaustion of their lodes as to underselling by newer and richer mining fields. The first conflict was with the enormously rich

⁵ Pryce, *Mineralogia Cornubiensis*, 191.

⁶ English, *Mining Almanack*, i, 120-129.

⁷ Worth, *Historical Sketch of the Origin and Progress of Mining Skill in Devon and Cornw.* 44.

⁸ De la Beche, *Geology of Cornwall, Devon, and West Somerset*, 594.

⁹ 'Copper Mining in Cornwall,' by Jos. Carne. *Trans. Roy. Geol. Soc. of Cornw.* iii, 63.

¹⁰ Worth, *Historical Notes on the Origin and Progress of Mining Skill in Devon and Cornw.* 44.

¹ Pryce, *Mineralogia Cornubiensis*, 240.

² Ibid. 188.

³ Ibid. 190.

⁴ Ibid. 191.

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Anglesey mines, which were reopened in 1778. The competition of the two districts, eagerly fanned by the Welsh smelters, sent the price of copper down to a point 20 per cent. below the cost of production,¹ and was stopped after seven years of rivalry, only by a combination formed among the mine owners to regulate the supply,² which lasted until the speedy exhaustion of the Anglesey deposits removed all danger of competition. In 1800, the Cornish mines produced 55,000 tons of copper ore, yielding about 5,000 tons of metal. In 1810 the latter figures had

increased to 5,680, in 1820 to 7,500, in 1850 to 10,700, and in 1856 to 13,274.³ This last figure proved to be the maximum. Directly following upon it came the growing competition of the American and Australian districts. As the price of copper fell lower and lower, mine after mine in Cornwall was forced to the wall, production fell off from year to year, and to-day, although a few large mines still earn good dividends, the Cornish copper industry, like that of tin, represents but a small fraction of its former importance.

FOUNDRIES AND ENGINEERING WORKS

The origin, progress, and decline of the foundry industry of Cornwall, and the important services it has rendered in the development of the mines are closely connected with the mining industry.

The first attempt to use steam in Cornish mines was made by Captain Thomas Savery at the end of the 17th century, though his engine was of little practical utility. Thomas Newcomen's 'Atmospheric' engine, which quickly followed, was the first piece of machinery in which steam was used with any measure of practical success. But notwithstanding the various improvements by Smeaton and the Cornish engineers the Newcomen engine was slow working, cumbrous, and excessively wasteful of fuel, and the limits of its utility were soon reached. As a consequence, at the end of the 18th century mining was very much hampered, and in many instances suspended.

There were no iron foundries in Cornwall until the 18th century was well advanced. The art of iron founding was in a backward state up to the time of the introduction of Watt's engine, in 1770. The castings for Trevithick's steam-carriage, about the year 1800-1, were made at the Hayle Foundry, and there was much trouble in getting the parts to fit together. The high-pressure whim-engine erected at Wheal Crenver and Abraham by Trevithick in 1806 was made at Neath Abbey, South Wales. Writing to Mr. Pengilly of that place as late as 22 May, 1813, relative to the engines for the Peruvian mines, Richard Trevithick says:—'All these castings (for the engines and pitwork) must be delivered in Cornwall in four months'; he also says, 'A great part of the wrought-iron work and the boilers I have arranged for in Cornwall.'

The cylinder of Trevithick's 76-inch Dolcoath engine, erected in 1816 (ceased working in 1869),

was cast in South Wales (very probably at Neath Abbey); the beam (still working in the new engine of 1869) was cast at Perran Foundry.

At Tarrandean, Perranarworthal, there was a small foundry in existence before the Perran Foundry; and as that was originated in 1791, it is evident that the old Tarrandean Foundry, established by a Mr. Read, ranks as one of the earliest in Cornwall.

The little maritime town of Hayle owes whatever of importance it has possessed to the existence of the two large foundries, the Hayle Foundry and the Copperhouse Foundry, which for many years were engaged in the manufacture of mining and other machinery.

The Hayle Foundry was situated in the parish of St. Erth, and had the advantage of commodious waterside premises. It appears to have been founded between 1765 and 1775, and became ultimately the largest and most important of the engineering works of the county, though at first it probably comprised only a forge and a fitting shop. The founder was Mr. John Harvey, who lived at Carnhell, in the parish of Gwinear. He was evidently an enterprising and a somewhat remarkable man, who, finding no scope for his energies in his native village, removed to Hayle, the nearest seaport, and therefore the most likely place for developing his business.

The first authentic reference to John Harvey occurs in the account-book of Richard Trevithick, sen. In the items of 'Dolcoath New Engine Cost Account,' 1775, is the following: 'John Harvey and partners for putting in the boiler and building the shed-wall, &c., £33 1s. 9d.' The following further reference in the same work, Francis Trevithick's *Life of Richard Trevithick*, is of interest: 'The John Harvey who worked to fix the improved boiler in its house was then a country smith at Carnhell Green, a small village a few miles from Dolcoath. He established the now famous Harvey & Co.'s engineering foundry at Hayle.'

³ Hunt, *British Mining*, 830.

¹ Thomas Williams, Letter to Lord Uxbridge; printed in Hunt, *British Mining*, 105.

² Geo. Unwin, *Letters and Remarks*, 37. Thomas Williams, Letter to Lord Uxbridge; printed in Hunt, *British Mining*, 105.

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He discovered in some way the art of casting pumps, and other parts of machines, but when is unknown—doubtless between the years 1776 and 1790. It has been stated that he found out the method in South Wales, possibly at the Neath works, which it appears he visited in 1776.

This enterprising man died in October 1803, at the age of 73 years, and was interred at Gwinear Churchyard, the 14th day of the same month. He was succeeded by his son Henry, 'the great Mr. Harvey,' as he was called, who was not an engineer in the technical sense. He regarded the foundry as only a factor in the development of the port. The foundry being well established, he threw his energies into the work of developing the harbour and its trading advantages, in which he was fortunate in having the advice of his brother-in-law, Richard Trevithick, the great engineer.

Henry Harvey died 7 May, 1850, aged 75 years. The tombstone in Gwinear Churchyard records 'After an active life in which he largely developed the Harbour of Hayle, together with the Foundry, and the trade at that Port.' Mr. Nicholas Oliver Harvey succeeded to the management. He was a great nephew of the founder, and died on 7 June, 1861. Later managers of the foundry were Mr. William Husband, who died on 10 April, 1887 (he was a man of striking personality, and was one of the most able of Cornwall's modern engineers); Mr. Nicholas John West; Mr. Henry Nicholas Harvey, who died 14 December, 1892, and Mr. Francis Haniel Harvey. The late Mr. Jebus Bickle was for a great many years the superintending and consulting engineer of the works; he was a man of great experience, and his opinion was always highly valued.

It is impossible to convey an adequate idea of the quantity and diversity of the machinery which has been supplied to mines in all parts of the world by Messrs. Harvey & Co. In this country there were few mining districts forty years ago where the Hayle engines were not to be found. Metalliferous and coal mines throughout Great Britain have been indebted to this firm for some of the largest pumping, winding, crushing and other machines for which for a long series of years they had an unrivalled reputation. Abroad, their engines have been used extensively for all kinds of mining. It is worthy of mention that the first pumping engine on the compound principle employed on any considerable scale was made by them for Great Wheal Alfred in 1823, Wolff being the engineer.

The principal extensions of the works and developments of the business were in the years 1847, 1854, 1888-1890. In the year 1883, for family convenience, the business was converted into a limited liability company.

In the year 1888 the company laid themselves out for large shipbuilding operations, and expended a very large sum of money in

enlarging their premises and laying down the requisite plant. Experienced shipbuilders were imported from the north, and a considerable number of additional men were employed; but the enterprise proved a failure and involved the company in a great loss. During this period, 1888-1893, the total number of men and boys employed was about 1,200, including the foundry employés. Previous to this the number employed was about 700 to 800.

Shipbuilding was abandoned in 1893; not long afterwards it became only too apparent that the engineering business was rapidly declining, and that the closing of the works sooner or later was inevitable. This calamitous event for the town of Hayle took place in October, 1903.

The smelting works of the Cornish Copper Company, built about or soon after the middle of the eighteenth century and situated at the eastern end of Copperhouse, and to the right of and alongside the main road leading to Camborne and facing Phillack Church, being unremunerative by reason of the cost of bringing coal to the works, were abandoned about the year 1806. In the same or the following year Messrs. Sandys, Carne, and Vivian having become owners of the property, including Ventonleague and part of Trevassack, the works were converted into a foundry. Later, on the retirement of Mr. Carne, who removed to Penzance and engaged in banking with others under the title of Batten, Carne & Carne, the name of the firm was changed to Sandys, Vivian & Co.

The greatest number of persons employed at anytime was from 300 to 350.

The works were conducted on a scale of considerable magnitude, as might have been seen a few years ago from the abandoned buildings, which extended from the present Market House to Ventonleague. The firm made their own gas; the remains of the gas-works could be seen a few years ago.

The foundry was closed in the year 1869. The decline of these important works was due to the closing of the local mines, the competition of other works and, it is stated, the lack of enterprise.

As a locally well-known fact it may be stated that there was always a great deal of rivalry between the Copperhouse and Hayle foundries, and as a consequence between the two places.

The Tuckermill Foundry was established about the year 1833 by Mr. William Vivian, who up to that time and for several years previously was employed by the Copperhouse Foundry Company. About ten years later he acquired the hammer mills and forges at Roseworthy belonging to his cousins, Joseph and John Vivian. These had been carried on since about the year 1815, the originator being Mr. John Vivian, the father of the two gentlemen named.

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Mr. William Vivian carried on the works conjointly until about the year 1865, when he found it necessary, owing to the severe strain on his financial resources through mining undertakings, to transfer a large proportion of his interest to a company with fresh capital. Soon afterwards Mr. Vivian's connexion with the two concerns ceased. He acquired a small foundry at St. Agnes, the centre of an important mining district, and died September, 1870.

Subsequent proprietors have been: 1840–1860, William Vivian, junr. and his sons; 1860–1868, Captain Wm. Teague, J.P. (the well-known mine proprietor); Richard Trevithick (Devon), Edward Burgess (mine proprietor), George Smith, LL.D., J.P., etc. (safety-fuse maker), Major John Bickford (safety-fuse maker); 1868–1904, William Bickford-Smith, M.P. (died 1898, safety-fuse maker); John Pike (died 1874), Sir George J. Smith, J.P. (fuse maker), John R. Daniell (solicitor), H. P. Vivian. Since 1904 Sir G. J. Smith has been the sole proprietor.

Besides being extensive makers of general mining machinery, the Tuckermill Foundry Company began, about the year 1889, to make rock drills for the Rio Tinto mines, and have since to a great extent specialized in drills and air-compressors. Their 'Little Hercules' rock drill and 'Economic' compressors have been supplied in great numbers throughout the world.

At the old Roseworthy hammer mills are made, in addition to ordinary work, the Cornish steel-faced shovels which, owing to their superior quality, appear to have ousted other kinds from the Cornish mines. Numbers are exported to various foreign mining camps where Cornishmen are at work.

The greatest number of persons employed at any time is from 200 to 300.

The Perran Foundry was situated in the charming Kennal Vale, on the right of the main road leading to Truro, and at the head of Restronguet Creek, about midway between Penryn and Truro.

From its magnitude and the importance of its manufactures, as well as from its interesting history, the Perran Foundry ranks next to that of Hayle.

It was established in the year 1791.¹ The original founders were George Fox, of Perran Wharf, ancestor of the well-known family of that name at Falmouth, and Peter Price, of Neath Abbey.

Several changes of proprietorship have taken place. Mr. Price died 13 September, 1821, when it is probable the connexion with the Neath

works and also with Mr. Price's family was severed.² About this time it appears that Mr. Benjamin Sampson, one of the principal shareholders of Tresavean mine, whence he derived great wealth, and also the principal owner of the Kennal Vale gunpowder works, became connected with the foundry. He built Tullimaar House, a short distance from the foundry, in the year 1828, at which time and for some years previously, he was manager of the works. He died on 7 November, 1840, aged seventy years, leaving with other property his interest in Tremough, the Kennal Vale works, and the Perran Foundry to his nephew of the same name. About the year 1848 or 1849 Mr. Michael Williams, of Trevince (born 1784) became the principal partner, and appointed his son, Mr. Michael Henry Williams, of Tredrea, manager, under whom Mr. James R. Carnall was works manager. In 1857 the Fox family disposed of their interest or the remaining part of it to Mr. Michael Williams. A year later, on the death of that gentleman at Trevince (15 June), Mr. John Michael Williams, of Pengreep, his eldest son, succeeded to his large interest in the works, which shortly afterwards were closed for a brief period.

Evidently negotiations took place about this time or soon after between various members of the Williams family relative to the foundry, for we find that Mr. John Michael Williams retained his interest for only a short time, selling it to his uncle Mr. (afterwards Sir) William Williams, of Tregullow. There were reconstructions and alterations, and the firm assumed the title of Williams' Perran Foundry Company.

On the death of Mr. Benjamin Sampson, in 1864, his share and other property passed by will to Mr. William Shilson, of St. Austell. Sir William Williams died March, 1870, his eldest son, Sir Frederick M. Williams, Bart., M.P., becoming the principal partner and manager; the other partners were Mr. George Williams, of Scorrier; Mr. Michael Williams, of Tregullow; and Mr. Shilson, of Tremough.

For several years after the starting of the business only small machinery and comparatively light forgings were made. 'Shingling,' the faggoting or welding together of scrap wrought iron with tilt hammers, was extensively carried on. Heavy forgings and castings were made at the Neath Abbey works. The days of the Nasmyth steam hammer were not yet; it is doubtful whether it was adopted in any Cornish foundry earlier than about the middle of the century. It is stated that the first heavy forging

¹ In Francis Trevithick's *Life of Richard Trevithick*, vol. ii, p. 169, it is stated that the steam-cylinder of Dolcoath 76-inch engine was cast in South Wales (presumably at the Neath Abbey works) in 1816; 'the beam, still working in the new engine of 1869, was cast in the foundry of the Williams at Perran.'

¹ The catalogue issued by the company in August, 1870, gives 1795 as the date; this is an error, as on three arches in buildings still standing the figures 1791 are clearly discernible.

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done at Perran Foundry was a gudgeon for the beam of the 85-inch pumping engine for Tresavean mine. At this time, about the year 1828 or 1830, the firm began to make heavy castings.

The foundry gradually grew in size and importance. A notable development occurred when the machinery for the Haarlem Lake Drainage and the East London Waterworks was made, about the year 1842. A Mr. Bowman of London was then the manager, having succeeded Mr. Benjamin Sampson.

The boiler-building works originally located at Devoran were removed to Modling, near Ponsanooth, about the year 1860. The company made their own gas and supplied private houses at the wharf. They were fortunate in having a good supply of water, which in dry summers was supplemented by steam-power.

The greatest number of persons employed at any time was about 400.

When, in the year 1870, nine years previously, the extensive mines in the parish of Gwennap, which drew nearly the whole of their machinery supplies from Perran and sent thither all their breakages, and other mines were closed, it was generally felt that a serious blow had befallen these works. On such a gigantic scale were the Clifford Amalgamated Mines carried on, with nearly a score of large engines at work, and with an enormous quantity of pitwork, that, with the other Gwennap mines, they were well-nigh sufficient to keep a moderate sized foundry running.

In the death of Mr. William Shilson on 28 March, 1875, the company lost a far-seeing and able financier. Whilst sharing with the Hayle Foundry the misfortune of a decaying home market and keen competition in this and foreign countries, and other untoward circumstances, the perhaps inevitable close was precipitated by the death of Sir F. M. Williams on 3 September, 1878; and the failure in the same year of the well-known banking firm of Tweedy, Williams & Co. sealed the fate of Perran Foundry, which ceased working in March, 1879. When the foundry was closed the Tuckermill Foundry Company took over the lease and carried on the business in a small way, under Mr. James Edwards' management; but not succeeding, after two years they disposed of the lease to Messrs. W. H. & T. P. Edwards, who, under the name of Edwards Brothers, adapted the premises to their requirements, and do an extensive milling and corn business, and employ a great many men. The works are now known as Perran Mills.

The St. Blazey Foundry was built by Mr. William West in the year 1848. Mr. West had a long and distinguished career as a mining engineer of nearly half a century—1831 to 1879. As an engineer Mr. West was much sought after, and carried out some of the most important works in the county and elsewhere. His most noteworthy achievements

were the erection of a steam capstan at South Hue Mine about the year 1835, the first of its kind ever put up, and the erection, with Mr. William Petherick, of the famous Austen's engine at Fowey Consols, which later played a most important part in the history of the Cornish engine. The demands made upon Mr. West were very numerous. It is stated that he could not get his orders carried out with sufficient dispatch and to his satisfaction. He therefore decided, in the year named, to start a foundry of his own.

The manufactures included mining machinery of all kinds, machinery for smelting works, waterworks, and railways. Although not of a magnitude comparable with the Hayle and Perran foundries, and employing not more than about sixty persons, many important undertakings for home and foreign mines were successfully carried out. Several Cornish mines, particularly in the middle and eastern parts of the county, were supplied with pumping and other engines, pitwork, and general machinery. Mines in other parts of the country placed orders for important engines with Mr. West, notably the Rhymney Iron Company, in 1865, who were supplied with a 70-inch pumping engine and pitwork. Orders for engines of very large size—beyond 60 or 70 inch cylinders—were passed on to the larger foundries at Hayle and Perran.

Some important contracts outside the ordinary scope of founders were successfully carried out, including the construction of the Newquay and Cornwall Junction Railway, begun in 1865, and in 1867 the Bodmin and Camborne Waterworks respectively were supplied with the necessary pumping plant. In conjunction with Mr. Darlington, Mr. West patented, in 1867, a method of working mines by a combination of steam-power and hydraulic apparatus. Many years earlier Mr. West invented the well-known valve for pumps, known as Harvey and West's double-beat valve, patented 12 June, 1839.

Mr. West died on 16 June, 1879, in his 78th year. The business was carried on by his sons William and Charles West, who were in partnership with their father under the name of William West & Sons. The death of the head of the firm, followed so quickly by that of one of the sons, was a great blow to the business. The circumstances named as exemplary of the decline of the Hayle and Perran foundries are equally applicable to this foundry, which was closed in December, 1891.

It is worthy of remark that Mr. West amassed a considerable fortune by his mining investments and his engineering business. His adventurous courage in resuscitating single-handed Phoenix Mine, which he worked with great vigour, will be long remembered. Employment was given to a large number of persons, and in other ways the enterprise was a great benefit to the neighbourhood.

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The Camborne Engineering Works, owned by Messrs. Holman Brothers, were established in the year 1839, by Mr. John Holman, father of the present proprietors. The name of Holman has been long and honourably associated with mine engineering and manufacture. The genesis of the present works and their successful career must be sought in the family annals. As far back as the 18th century the Holmans were men of repute as smiths and mechanics. In the year 1802 Nicholas Holman, grandfather of Messrs. John H. and James M. Holman, established what is now known as the Cornwall Boiler Works, at Roskear. This was mainly due to the large demands of Richard Trevithick, who in the same year ran the first successful locomotive on the turnpike roads of Camborne. The progress of the Boiler Works was greatly helped by the introduction of high-pressure steam, which revolutionized the existing form of boilers.

Nicholas Holman had four sons, all of whom became boiler-makers, or iron founders, namely: Nicholas Holman, at St. Just, James Holman who carried on the boiler works at Pool, William Holman, manager of the boiler works at Copperhouse, and John Holman, of the works at Camborne.

In 1880 Mr. Holman handed over the business to his two sons, since when the works have been considerably enlarged, and the business has been developed to an extent that has placed it in a foremost position amongst mining engineering firms.

The works at Wesley Street, Camborne, known as the 'Engineering Department,' cover over six-and-a-half acres of land, and employ many hundreds of persons, and are equipped with the most modern machinery. In another part of the town the firm have a Rock Drill Department, with a capacity for an annual output of more than a thousand drills. As far back as 1882 the 'Holman,' then known as the 'Cornish' Drill, had established a high reputation for excellence and efficiency. A large number of the Holman drills are in use in the South African and other foreign mines.

At Roskear are situated Messrs. Holman's Cornwall Boiler Works which date back a century, and are equipped with every appliance for coping with present-day demands. Here boilers of all descriptions are made.

The Docks Foundry, Falmouth, belonging to Messrs. Cox & Co., was established for the purpose of building iron and steel vessels, marine engines, etc., and for ships' repairs, and employed at the beginning from 15 to 20 persons only.

The work carried out by this enterprising firm includes the building of steam trawlers, steel, iron and composite steam yachts, barges, tugs, passenger tenders, and marine engineering of all kinds. Shipbreaking is a branch of the business added of late years.

The works are equipped with the most modern pneumatic and hydraulic plant for drilling, riveting, caulking, and other operations. They comprise two forge shops, with three steam hammers, fitting and erecting shops, brass and iron foundry, with three large drying stoves, copper-smiths' shop, boiler-yard, and two ship-yards, with six covered building sheds; also pattern-makers', boat-builders' and joiners' departments fitted with up-to-date machinery.

Messrs. Cox & Co. have a private wharf with large lifting shears at the end; from the wharf a branch line runs past the various portions of the works to the Great Western Railway system. The firm make their own forgings, and can turn in lathe to 10 ft., and build boilers up to 14 ft. in diameter. On the closing of Perran Foundry the firm made provision for dealing with heavier castings and forgings and larger general engine work than they had hitherto attempted.

The number of workpeople varies according to the work in hand, from about 500 to 600.

The works were originated in the year 1868 by Joseph G. Cox, Henry H. Cox, and C. Farley, trading as Cox, Farley & Co. Ten years later Mr. Farley's connexion with the firm ceased, the remaining partners continuing as Cox & Co. In December, 1901, these gentlemen disposed of the business to the present proprietors, Messrs. Herbert Henry Cox, Walter R. Cox, Ernest G. Cox, Alfred Cox, and William D. Cox.

With regard to Budge's Foundry at Tuckingmill, one of the earliest, perhaps the earliest in the county, the following references appear in Francis Trevithick's *Life of Richard Trevithick*:—'Richard Trevithick, senr.'s account-book, closing in 1775, states that Mr. Budge was paid, for erecting Dolcoath engine, £63.' Elsewhere we read: 'Mr. Budge was the working engineer erecting it (Dolcoath engine).' We also read of 'Budge's Foundry' and 'Budge, a clever mechanic, who had a foundry at Tuckingmill.' The writer has been informed by Mr. Leonard W. B. Smith, that in turning over family documents he found that a Mr. Budge was resident in Tuckingmill in 1765. This person was probably the iron-founder of that name.

One of the earliest of Cornish foundries was that of Messrs. Thomas Reed and Co., situated at Tarrandean, Perranarworthal, and was built some years before the Perran Foundry in the same parish. It was known as Tarrandean Foundry. The foundry was closed before 1805.

The St. Agnes Foundry, situated about half a mile from Trevaunance Quay, St. Agnes, was originated by Messrs. Thomas and Son, and some years later was acquired by Mr. William Vivian, founder of the Tuckingmill Works. A Mr. Curtis afterwards took over the works, but owing to his bankruptcy, they were closed for about ten years.

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The foundry was a very small one, never employing more than ten persons. It was closed in 1904. It was worked for a short time by Redruth Foundry Company.

Several foundries have been established at Redruth, all on a comparatively small scale, the most important being that originated by the late Mr. G. H. Prout about the year 1875. It was carried on for some years in a small way as a private concern. By enterprise and ability Mr. Prout developed the concern to such an extent that after about a dozen years it became necessary to introduce additional capital. Friends joined the founder and formed a limited company, further development of the business resulting. Owing, however, to shortage of money and depression in mining the company became insolvent, and was wound up in the year 1899.

The present company—the Redruth Foundry Company, Limited, of which Captain Joseph Pryor, M.I.M.E., C.E., is the managing director, purchased the works as a going concern. With ample capital and the infusion of good business ability and energy, the company have been very successful, and now employ nearly 100 persons.

The machinery is driven by electricity. All kinds of mining machinery are made; a speciality is the patent Automatic Feed Amalgamator or Pulverizer for crushing gold, tin, etc. The company also do a good business with their well-known Cornish Cooking Ranges; they also build carriages.

For a short period the company worked the St. Agnes Foundry as a branch.

Messrs. R. Stephens and Son's Works at Carn Brea are almost exclusively devoted to the manufacture of rock drills. Their 'Climax' drill has achieved a high reputation in the mining world. The works were originated in the year 1880 by the late Mr. Richard Stephens, the father of the present proprietor, Mr. W. C. Stephens. They were laid down on a somewhat small scale for the manufacture of rock drills, which has been steadily followed to the present time. The development of the works has been gradual, necessitating from time to time the acquisition and laying-down of additional and up-to-date plant. The number of employes has increased from less than a dozen in the early stages of the works to nearly 200.

Having concentrated their thoughts and energies on the design and production of rock drills, the firm may claim to be specialists for these machines. Enormous numbers of their drills have been supplied to the South African, Indian, Australian, and other markets, where they are as familiar as in the Cornish mines, and where the firm claim to have attained record boring results. Latest improvements in their drills are the patent Climax Dust Allayer and the patent Simplex Tool-holder. The firm attach the

utmost importance to the Dust Allayer as a preventive of miners' phthisis.

About the year 1854 Mr. John Jewell and a Mr. Hosken erected a small foundry at Basset Wharf, Tarrandean, in the parish of Perranarworthal. Employment was afforded for about ten or a dozen persons who were engaged on general mine repairs. With the closing of the local mines this work fell off. It was then converted into a bone-crushing mill, but was closed without actually being set to work as such. Mr. Jewell died about the year 1887-1888.

In November, 1893, Mr. Walter Visick of the same parish, an enterprising mechanic and engineer, acquired the property from Mr. Basset of Tehidy, and began operations under the name of W. Visick and Sons. Beginning in a very small way, a good business has been developed, and employment is now given to about thirty persons. The usual work is hand and steam derrick and other cranes, steam winches for ships, steam blondins or aerial railways, motor work, railway and other contractors' plant, locomotive and traction repairs.

A small foundry was established at Saltash in the year 1877 by Messrs. Loam and Son for making rock drills, and was worked for thirteen years, being closed in 1890 in consequence of the expiration of the patent and the unremunerative nature of the business.

In the *Parochial History of the County of Cornwall*, vol. iv, published by William Lake, Truro, in 1872, reference is made under the heading of Stithians to 'Bryant's Foundry,' and to the village of 'Foundry' in the parish. The term is a misnomer, and is a mere localism. About a century ago a small hammer mill was built by a John Bryant, and afterwards worked by one John Bache. In the year 1891, a Mr. Randle acquired the property, the mill having been idle for several years; it was closed between the years 1875-1885. The only articles that were made, it appears, were shovels; never more than three persons were employed.

The foundry of Messrs. Sara and Burgess was originated in the year 1857 by the late Mr. Nicholas Sara, at one time a foreman at Perran Foundry. On his retirement in 1887 his son, Mr. E. B. Sara, was joined by Mr. John Burgess, formerly of Perran Foundry, and the business of marine and mining engineering, boiler-making, etc., was carried on in the name of Sara and Burgess. On the death of the latter in 1889, Mr. Sara was joined by his son. General mining machinery has been made for South Africa and Spain. For home industries and local concerns a good business has been done. The works formerly employed from 140 to 150 persons, but owing to depression, competition, and other causes the number is now only about fifty. Mr. Nicholas Sara, the founder of the business, died at Falmouth in 1895, aged eighty-three.

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On the 9 April, 1860, the late Mr. William Sara began business as a founder at Tolgus, Redruth, for making light castings, stamps' heads, etc., for the local mines. During the years 1860 to 1870 a good business was done, and employment was found for from fifty to sixty persons.

Mr. Sara died in 1883. The foundry has been carried on since then by his sons. During the past few years operations have been very largely curtailed owing to the closing of so many of the neighbouring mines. There are now not more than about half a dozen mines at work in the district, and the number employed in the foundry at this time does not exceed ten. Mr. W. H. Sara, the only surviving son, is the present proprietor.

The Penzance Foundry had its origin in the small foundry carried on by a Mr. Jeffery which Mr. Nicholas Holman of St. Just purchased in 1840. He carried on this branch for several years in conjunction with the business at St. Just. Additions were made from time to time, the most noteworthy being Symons' Shipbuilding Yard in 1862. During the following thirty years attention was paid specially to mining plant. In 1893 the engineering premises and plant of Mr. John Bond in Market Jew Street were purchased and worked in connexion with the foundry on the wharf. In 1895 a cycle business was established, to which later was added a motor department. Two years later the Jubilee Hall in Market Jew Street was purchased and added to the engineering premises, and in 1899 the workshops were pulled down and rebuilt. The Penzance Graving Dock and premises were purchased and put into good repair and equipped with the necessary machinery for the building and repairing of ships. These premises were formerly known as Mathews' Dry Docks, and were used for many years by the defunct firm of Messrs. Martin, Matthews & Co., Ltd.

The St. Just Foundry was built in the year 1834 by Mr. Nicholas Holman of Pool, Illogan, and the business is still carried on by his sons and grandsons. Beginning in a small way in smithery and casting and the manufacture of agricultural implements, Mr. Holman, by perseverance, energy, and good business ability, made considerable progress and added a large fitting and engineering shop, and began making Cornish mine boilers. In the year 1855 hammer mills were built and two tilt hammers installed—since replaced by Nasmyth hammers, for which a separate engine was built. Six years later a wheelwrights' branch was added. In 1860 a complete gas plant was laid down for supplying the works and the town with light. In 1872 larger fitting and erecting shops were built.

In 1840 Mr. Holman started a branch business at Penzance. All kinds of mining machinery are made, as well as agricultural im-

plements. When the mining industry declined the firm developed their agricultural implement and general business, making windmills, water-wheel pumps, cooking ranges, etc.

In the year 1867 the founder died at the comparatively early age of 63. Since 1894 the firm has been a limited liability company under the name of Nicholas Holman & Sons, Ltd.

The foundry at Truro, known as Dingey's, was originated by two persons, named Burnett and Jeffery in or about the year 1835. After a few years they were bought out by a Mr. Webb. Mr. Jeffery subsequently re-purchased the business, and in a few years took his son into partnership, built new workshops and developed it into a prosperous business for five or six years. Ruined by mining speculations the property was acquired by Messrs. Hamilton & Dingey. This partnership lasted about fourteen years, when Mr. Dingey bought Mr. Hamilton's share. The business was then carried on under the title of Francis Dingey & Sons. The number employed was about twenty.

All kinds of mining machinery were made including the pulverizer bearing Mr. Dingey's name. A considerable quantity of work was done for the Perran iron mines. The requirements of the city and agriculture found much useful work for this little foundry.

Owing principally to the want of capital the foundry was closed about seventeen years ago.

In the year 1840 the late Mr. John Toy began business at Meneage Street, Helston, as a general machinist, and a few years later started a foundry which has continued to the present time. Originally all kinds of agricultural machinery and implements were made—threshing and winnowing machines, ploughs, etc. The hay tedder, which has had a very large sale, was invented by him. A little later Mr. Toy began making such general mining machinery as came within the range of the limited capacity of his works, and doing repair work. The product by which he was best known was his useful lifting jack, which was made in several sizes, up to 25 tons lifting capacity. It is stated that many thousands of these have been supplied to mines and other works at home and abroad.

When mining declined Mr. Toy turned his attention to the requirements of shipping and fishing, and by cultivating this business and pushing the agricultural implement trade, and general house work, etc., sought compensation for the loss of the mine work.

Mr. Toy died in the year 1900. The business is carried on by his son, Mr. John Toy, who has introduced pulverizing machinery for the reduction and extraction of ore from mine refuse.

The Charlestown Foundry, owned by the Charlestown Foundry and Iron Works Co., Ltd., was established by Mr. James Thomas about the year 1845, on a small scale, to meet the demands

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of local mines. Mr. Thomas died in 1861, leaving the works to his two sons, James and Edwin Thomas. After the death in 1880 of the former, who survived his brother, the works were carried on by the beneficiaries until 1884, when they were purchased by Mr. Martyn of St. Austell, for the purpose of starting them under a limited liability company. The present company was accordingly formed, and by them the works were greatly enlarged and improved, and a bridge-building department added, with modern appliances and tools. Owing, however, to the heavy carriage expenses of sending bridges long distances this part of the business was not remunerative and was abandoned, the plant being utilized for boiler-making. A good business is done in large Lancashire and Cornish boilers for the china clay works and local mines, and for Plymouth.

The works are well equipped, and are capable of dealing with the entire engineering requirements of the mines, and more particularly of the china clay industry. Mining machinery of every description is manufactured, besides bridges, roofs, girders, tanks and other constructional iron work.

Bartle's Foundry was established about the year 1860 by Messrs. Bartle, William Dunkin, Thomas Henry Tregoning and Joseph Lugg, at Carn Brea, the centre of a busy and populous

district, and in the midst of mines for the purpose of supplying the latter with general foundry and iron work.

By dint of hard work a good business was formed. After a few years Mr. Lugg retired, and the concern was carried on by the remaining partners until the year 1884 when, owing to disagreement, it was suspended and was offered for sale. Mr. F. Bartle, one of the founders, became the purchaser, and with his sons, Mr. Charles D. Bartle and Mr. William Bartle, who returned from America for the purpose, has carried on the business ever since under the title of F. Bartle & Sons.

The works have been enlarged, and the business considerably developed, being well known in the mining world. The persons employed number from 70 to 100.

The manufactures include the Murdoch Rock Drill and tube mills. The patent of the latter was held by this firm, and was formerly known as the Barrel Pulverizer. Michell and Tregoning's Pulverizers are also made; large numbers of both kinds are working in Cornwall and other places. The firm also make a speciality of slime-dressing machinery, and have just patented an improved Slime Concentrator. They are also well-known makers of double faggoted iron, large quantities of which they send to South Africa.

CHINA CLAY

No account of Cornish Industries can claim to be complete which does not include a sketch, however brief, of that industry which is, and has always been, since its inception about the middle of the eighteenth century, the most uniformly progressive of them all.

The causes, mechanical and chemical, which have led to the formation of china clay are well known. On the one hand, variations of temperature and the congelation and consequent expansion of water within the minute pores of granite rock; on the other, the concurrent chemical action of carbonic acid, robbing the felspar and mica contained in the granite of their potash; these are commonly held to have been the chief causes of that process of disintegration by which china clay, or kaolin, has been formed.¹

Wherever in Cornwall there is a granite formation—the Carnmenellis district excepted—china clay has been formed. West Penwith, Breage, the moors north of Bodmin, all contain deposits; but by far the most considerable as well as the most valuable clay beds are those of the Hensbarrow district which embraces large portions of the parishes of St. Austell, St. Blazey,

Luxulian, Roche, St. Denys, St. Enoder and St. Stephen in Brannel.

About the middle of the eighteenth century the presence of this valuable product became known to the potter. Mr. William Cookworthy, who had established a pottery in Plymouth in 1733, obtained in conjunction with Lord Camelford a patent for the use of china clay in 1768. In 1813 there were seven clay beds being worked in the Hensbarrow district, the largest of which produced about 300 tons of clay per annum.² The amount of china stone shipped at Charlestown in 1816-17 was 2,135 tons, and of china clay 1,775 tons.³ Since that time the returns have steadily increased, as will be seen from the following table⁴ :—

| Year. | China Clay. | China Stone. | Total. |
|-------|-------------|--------------|------------------------|
| 1816 | . 1,775 | . 2,135 | . 3,910 ³ |
| 1826 | . 7,538 | . 5,252 | . 12,790 ³ |
| 1838 | . 13,440 | . 7,344 | . 20,784 ³ |
| 1855 | . 60,188 | . 19,961 | . 80,149 ⁴ |
| 1864 | . 95,730 | . 21,570 | . 117,300 ⁴ |
| 1874 | . 150,500 | . 42,500 | . 193,000 ⁴ |
| 1894 | . — | . — | . 386,648 ⁴ |
| 1903 | . 490,881 | . 53,680 | . 544,561 ⁴ |
| 1904 | . 515,451 | . 66,994 | . 582,445 ⁴ |

² *Annals of Philosophy*, vol. ii, p. 475.

³ *Trans. of the Geol. Soc. of Cornw.*

⁴ *Mineral Statistics*, published by the Home Department.

¹ It should be mentioned that a very competent writer, Robert Hunt, F.R.S., considers china clay to be granite which has never properly been formed, rather than granite which has undergone decomposition, See *British Mining*, p. 196.

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For the purpose of raising the china clay to the surface and preparing it for export, the following method is generally adopted, allowance being made for such modifications as the nature of the locality and economical working require. A shaft having been sunk to the required depth alongside the deposit, a level is then driven underneath the clay which is to be raised. From the level thus made another shaft or 'rise' is carried, through the clay, to the surface. The overburden of earth and foreign matter having been removed, a square wooden pipe or 'launder' is inserted in the 'rise' which is then filled up with clay. This 'launder' is furnished at intervals with holes which, until occasion requires, are kept closed. Arrangements having been made for the supply of a small but continuous stream of water to the clay bed, the surface of the clay bed is now broken up with picks so as to enable the clay to mix readily with the water. The water, holding the clay in suspension, is then carried down the 'launder' and along the level to the shaft, whence it is pumped to the surface. The milk-white liquid is next conveyed by a series of channels to the clay pit, the channels being so arranged, and the rate of flow so regulated by hatches, as to ensure the deposition of all the heavier particles of sand and mica on the way. In the clay pit the clay is allowed to settle and the water is drawn off, to be used over again for the same purpose. From the pit the clay is 'landed' into an adjacent tank by the removal of a plug near the bottom of the pit. While in the tank the surface water is drawn off from time to time until the clay assumes the consistency of thick cream. From the tank the clay is conveyed to the kiln, where it is cut up into squares, and the remaining moisture driven off by the application of artificial heat. It is now ready for transit.

The uses of china clay are various. It has been stated, on good authority, that probably not more than one-third of the clay now produced is used in the manufacture of porcelain. In the sizing of cotton goods and in paper-making—for the purpose of adding weight and consistency; and in the manufacture of alum, ultramarine, crayons, water colours, and other similar products, vast quantities of china clay are required, both at home and abroad. Besides supplying the home markets, the chief of which are the Staf-

fordshire Potteries and Lancashire, there is a considerable export to the United States, Holland, Belgium, Italy, Spain, France, Germany, and Austria.

A good clay-bed will produce from 1 to 2½ tons of clay to every cubic fathom. The selling price of china clay per ton is from 13s. to 25s.; but the larger amount consists of medium clays. The official estimate of the value of the output for the year 1904 was evidently calculated upon a much lower selling price, for the purpose, doubtless, of including inferior products, mica-clay, etc. Even so, considerably over £320,000 was realized by the merchants in that year, and there are at present no signs of a decline.

China Stone is granitic rock consisting of quartz, decomposed felspar, and white mica. It occurs chiefly in the parishes of St. Austell, St. Denys, and St. Stephen in Brannel, and has long been used in these and in the neighbouring parishes for building purposes. The towers of Probus and St. Stephen's churches are built of china stone. In 1817 the amount shipped for the manufacture of pottery exceeded that of china clay; but of recent years, although the output has steadily increased, it has formed less than one-eighth of the whole. Its price varies, according to the quality of the stone, from 8s. to 12s. per ton. China stone is obtained by quarrying, and before being used, requires to be finely ground. The grinding is sometimes performed in Cornwall, but usually it is done at the potteries, where also an addition of felspar and other ingredients is made to meet the requirements of the particular ware it is sought to manufacture.¹

¹ A carefully written and exhaustive account of the 'Hensbarrow Granite District' by J. H. Collins, F.G.S., appeared in 1878. To this and to the mineral statistics published by the Home Department, and also to Mr. F. N. Olver of St. Just for advice, the present writer is chiefly indebted for the foregoing sketch. Much interesting matter may be found in 'A Treatise on China Clay,' by David Cock. The chapter devoted to this industry by Mr. Brenton Symons, F.C.S., in his 'Geology of Cornwall,' is for the most part a verbatim reprint of the account given by Mr. Collins, to whose work the reader is referred for a fuller treatment of the subject.

HORTICULTURE

The warm and equable climate rather than the nature of the soil of the south-western portion of Cornwall and of the isles of Scilly has within recent years led to the extensive cultivation of flowers for the London and other markets. Inasmuch as this particular industry has grown up within living memory, it becomes necessary to indicate briefly the successive

steps which have led to its present importance. The home of the industry is Tresco, one of the islands of Scilly, and its parent and prototype, the narcissus. Various theories have been propounded to account for the presence, from time immemorial, of some half-dozen varieties of this flower, chiefly at Holy Vale and at Tresco. Whether these were introduced by some mem-

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ber of the great family of Blanchminster, whose castle was at Enor and prison at La Val,¹ or by the Benedictine monks who had a cell at Tresco,²

These other flames,
The spirits of men contemplative, were all
Enliven'd by the warmth, whose kindly force
Gives birth to flowers and fruits of holiness.³

or, at some later period, perchance by some officer of the garrison stationed at St. Mary's, it is now impossible to determine. But there the flowers were, and there they flourished luxuriantly. The isolation of Scilly had always thrown the inhabitants largely on their own resources. For generations their only marketable commodity was kelp, which they obtained in large amount by burning the ore-weed which has always been very abundant on the rocky shores of the islands. The kelp industry was ruined by a right of pre-emption which was claimed by the lord proprietor and injudiciously exercised by his steward, and also by the discovery of chemical substitutes for kelp. Various attempts were made to introduce fisheries, but all these proved abortive. The cultivation of early potatoes followed and was attended with success, but it also served to remind the Scillonians of their extremely precarious means of subsistence. A hard frost or a sudden gale meant the utter destruction and loss of the crop. In or about the year 1870, Mr. Augustus Smith, lord proprietor of the isles of Scilly, advised some of his tenants to send a consignment of narcissus flowers to Covent Garden market. The credit of acting upon this advice is shared between Mr. Richard Mumford of Holy Vale and Mr. William Trevellick of Rocky Hill. The first consignment was small and realized only £1. Thenceforward, however, for a few years, at Tresco Abbey gardens and on a few farms, flowers were cultivated, but with

indifferent success. In 1880 flower culture first became remunerative on a small scale. In 1883 Mr. T. A. Dorrien-Smith, nephew of Mr. Augustus Smith, who had succeeded his uncle as lord proprietor, determined to study closely the cultivation of the narcissus, and for this purpose he visited Holland, Belgium, and the Channel Islands. Finding that the flowers were a month earlier in Scilly than in those places, he purchased bulbs largely, for himself and for his tenantry. The export of flowers, from the Scilly Isles alone, rose in 1885 to 65 tons. The amount was 100 tons in 1887, and has continued to increase, with slight fluctuations, the returns for the last few years having been as follows:—⁴

| | | | |
|---------|------------|-------------|-----------|
| In 1901 | the export | amounted to | 650 tons. |
| „ 1902 | „ „ „ | 750 „ | |
| „ 1903 | „ „ „ | 700 „ | |
| „ 1904 | „ „ „ | 800 „ | |
| „ 1905 | „ „ „ | 700 „ | |

On the mainland the cultivation of the narcissus for the market was first undertaken by Mr. Andrew Lawrey of Varfell, in the parish of Ludgvan, in the year 1885. Since that date flower farms have been formed in the parishes of St. Burian, Gulval, Lelant, Madron, Mylor, and Paul, but Varfell continues to occupy a leading position both for flowers and vegetables in West Cornwall.

On the islands little is done by way of manuring the land for narcissus, the chief thing being the separation, removal, and transplanting of the bulbs every three years to prevent deterioration. On the mainland, however, sea-weed and bone meal are extensively used. It is also claimed that the heavier soil of Ludgvan and elsewhere produces more robust plants and better blooms than the sandy soil of the islands. In order to protect the flowers from the fierce equinoctial gales the land is cut up into rectangular strips, and these are surrounded by hedges of veronica, escallonia, and privet. The flower harvest begins on the islands in January, and continues until the end of May. On the mainland it is, roughly speaking, ten days or a fortnight later. This affords employment to great numbers of men, women, and children. The flowers are gathered and tied up in bunches of twelve each, and are then packed in boxes and sent to most of the large towns of the United Kingdom. The price of the flowers varies; early in the season a dozen bunches will fetch as much as 3s. or 4s., late in the season the price will sometimes be less than one-third of that sum. The narcissus is not cultivated extensively under glass except at Tresco, where a flower crop, followed by tomatoes, has proved very remunerative. The varieties of the narcissus which may be considered indigenous to

⁴ The writer is indebted to the Great Western Railway for these returns.

¹ Pat. Roll, 3 Edw. II, May 10.

² This conjecture, which has hitherto been based solely upon the known habits and tastes of the Benedictine monks, receives some support from the fact that also on the slopes of St. Michael's Mount the variety of the narcissus known as the Scilly White, which grows wild in Scilly, has flourished from time immemorial. Until the reign of Henry IV the monks of St. Michael's Mount and those of Tresco were of the same order—the order of St. Benedict. It was Henry V who granted St. Michael's to the abbess and convent of Syon (*Cal. of Pat. 2 Henry VI*, p. 205). Assuming therefore a Benedictine origin for the flower, its introduction to Scilly and St. Michael's Mount must have taken place in or before the beginning of the fifteenth century. From recent enquiries which the writer has caused to be instituted at the Jardin des Plantes it would appear that the Scilly White is also found growing wild on Mont St. Michel, the seat of the original foundation of the Benedictine order—a further corroboration of the theory that the Benedictines introduced the narcissus into Cornwall.

³ Dante, *Paradise*, xxii, 44.

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Scilly are:—The *Scilly White*, and the old English *daffodil* (both of which grew in abundance at Holy Vale, Newford, Trenoweth, and elsewhere on the islands), and *Grand Monarque*, of which great quantities were to be found on Garrison Hill. For some years the only other varieties cultivated were:—*Soleil d'or*, *Glorioso*, and *Ornatus*. Every year, however, brought fresh cultivators into the field, and new varieties to the stock, which now number over 200. The chief varieties in addition to those already mentioned, which are extensively grown, are:—*Sir Watkin*, *Horsfeldii*, *Emperor*, *Empress*, *Sir Henry Irving*, *Princeps*, *Golden Spur*, and *Incomparabilis*. Of these *Princeps* and *Incomparabilis* crop heavily only once in three years. Time brings its revenges, and Holland which formerly supplied the bulk of the bulbs for Cornish cultivation is now a large importer of Cornish bulbs. The Cornwall Spring Show in April, and the Scilly Flower Show, which formerly took place in March, have done much to encourage this industry both by calling attention to the beauty and perfection of the flowers grown in Cornwall, and by introducing Cornish growers to new varieties of the narcissus.

The narcissus is not the only flower grown for sale. Before its cultivation was seriously resolved upon, the wall-flower had been profitably grown for years. At the present time besides wall-flowers and narcissi (and, to a much less extent, tulips, freesias, hyacinths, ixias, and sparaxis), the gladiolus, iris, and violet on the mainland, and the arum, marguerite, and blood-red anemone on the islands, are grown in great profusion. Moreover there is good reason to believe that owing to its mild and salubrious climate the inhabitants of West Cornwall especially will in years to come be drawn more and more strongly towards an industry which already affords employment to a very large number of persons of both sexes, and which, involving as it does the constant exercise of the powers of observation and no little scientific knowledge, seems eminently suited to the genius of the Cornish people. That it can become a source of considerable profit, wherever intelligence and industry are found combined, is beyond question.

So far the cultivation of flowers has been treated exclusively as a source of profit. Without going into detail, however, it may be allowable, at this point, to call attention to the exceptional interest which attaches to the gardens of some of the larger country seats in the county. The same conditions which have contributed to the profitable cultivation of flowers have also contributed to the singular success which has attended the efforts of those who have grown flowers and shrubs as a source of pleasure and recreation, and as affording a subject for scientific study. Wherever the gardener's art is allowed free scope, pretty and picturesque effects can always be obtained; but in Cornwall some-

thing more than this has been attempted and has been achieved. The magnificent collections of rhododendrons (sikkims) and other effective trees and shrubs at Tregothnan, Heligan, Killiow, Carclew, Tremough, and Pentillie Castle (which is also famed for its azaleas), the flowering sub-tropical shrubs and orange trees of Mount Edgcumbe, the sub-tropical shrubs and plants of Tresco, Menabilly, Killiow, Trewidden, and Penjerrick, the herbaceous and Alpine plants of Trehane and Ludgvan Rectory, the flowering shrubs and tree ferns of Caerhayes and Bosahan; these are but a few of the many gardens in Cornwall which bear witness to the perseverance, enterprise, and knowledge of the owners of those famous houses.

Equally important, if somewhat less interesting, is the cultivation of vegetables. The West Cornwall potato trade has been in existence since the year 1820, but it is only within the last twenty-five years that market gardeners have given special attention to it. It is noteworthy, however, that as soon as their efforts were directed towards the growing of early potatoes they met with complete success. The fact that potatoes could be produced in the open eight or ten weeks earlier in Scilly than in the Midland counties led to extensive operations, not only on the islands but also on the sunny southern slopes of West Cornwall. At first round potatoes were tilled, but very soon these gave place to Myatt's Early Ashleaf and other modern varieties. The seed potatoes usually arrive in October. They are immediately placed in a storeroom to shoot, and are planted in January and February. On the islands fishing nets are used as a protection against the devastating winds which sweep across the islands in early spring. The potato season extends from the beginning of May to the end of June. The average yield per acre on well-cultivated farms of elvan soils amounts to 10 tons in May and to 14 tons in June. On the islands, however, it is much less. The crop depends largely upon the amount of manure supplied, a ton of guano and 160 loads of dressing to the acre being used where a heavy crop is expected. The cultivation of potatoes under glass is not generally adopted. Now that steam navigation has replaced the slower methods of transit and the cost of freight is so small, a supply of early potatoes, grown in the open, can be procured from abroad for the greater part of the year; and hence there is no likelihood of artificial modes of cultivation ever becoming general. The railway company's returns, hereunder given, represent approximately the potato crop of West Cornwall for the years referred to:—

| | Tons sent off by train. |
|----------------|-------------------------|
| 1901 | 4,600 |
| 1902 | 6,100 |
| 1903 | 6,300 |
| 1904 | 5,200 |

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No sooner has the potato crop been gathered than preparations are made for the planting of cauliflower and broccoli.¹ This accordingly takes place from the middle to the end of June, the seeds having been sown about the middle of March. A continuous supply of these vegetables is secured from November to April by selecting several varieties of seed. For the successful cultivation of broccoli, heavy soil is chosen and ammoniacal manure is used. Reckoning 100 crates to the acre, and 14 crates to the ton, land suitably chosen will yield between 7 and 8 tons to the acre. The farmer seldom gathers his own broccoli harvest. It pays him better to receive £15 to £20 per acre for the standing crop than to cut, pack, and send it off in crates; while at the same time the buyer, whose operations usually extend over a wide area, is enabled to meet the demands of the markets by a steady and constant supply. The amount of broccoli from West Cornwall (chiefly from the parishes of Gulval, Madron, Paul, Lelant, Ludgvan, St. Ives, and St. Burian) during the last five years is supplied by the following table :—

| | Tons of broccoli sent off by train. |
|----------------|--|
| 1901 | 16,900 |
| 1902 | 15,200 |
| 1903 | 17,000 |
| 1904 | 14,400 |
| 1905 | 19,100 |

From this it will be seen how extensively this vegetable is cultivated and also that its cultivation is steadily increasing.

Asparagus is grown successfully at Tregirls, near Padstow, at Varfell in Ludgvan, and, on a smaller scale, in a few other places. Lack of capital deters many from engaging in this very profitable industry. Four years—the time required for the plants to mature—is considered too long a time to wait for a return. At the same time, it is agreed by all who have given attention to the subject, that the deep sandy loamy soils bordering the Cornish coast, well manured from time to time with seaweed and shell sand, are especially adapted for the culture of asparagus; and here it may be noted that seaweed as a manure is valuable for every crop, and is very extensively used by market gardeners. It requires to be buried immediately, otherwise the potash, its chief fertilizing ingredient, escapes.

¹ A note in the *Bath and West of England Journal*, by the late Rev. Thomas Phillpotts, of Porthgidden, explains the origin of this industry. It states that Mr. Dupen, of Hayle, in the year 1836, took to Bristol, in a boat which plied between those ports, 4 dozen of broccoli and sold them at a profit. On his next voyage, in the same year, he took 14 dozen. In the following year one Temby, of Redruth, bought a consignment of broccoli from Benjamin Roberts, of Boscathnoe, and disposed of the same in London.

At Tregirls asparagus farm as much as 7s. 6d. has been obtained for early cuttings of 100 sticks, and the price seldom falls below 2s. At Varfell 100 sticks have been known to weigh as much as 16½ lb.

Seakale is another vegetable which thrives in Cornwall. It has been and is still grown in various places with good results.

Tomatoes, owing to the humidity of the atmosphere, seldom ripen in the open; but under glass, following an early crop of flowers or other vegetables, they have been found profitable.

Formerly cucumbers yielded a large margin of profit, as much as 20s. a dozen having been obtained; but now, owing to the general introduction of glass-houses, the supply has increased and the price is no longer sufficient to induce gardeners to devote much attention to their cultivation.

Fruit-growing is also an important industry. In West Cornwall it has never been extensive, and is probably declining. The raspberry has suffered from the weevil pest, and the strawberry and currant are less cultivated than they were fifty years ago. In Kea parish the plum orchards are still famous both for the black Kea plum, which is peculiar to that parish, and also for red and grey varieties, the latter of which resembles the greengage, though somewhat smaller, and is valuable principally because it is the first to ripen. Apples are grown chiefly in the hundred of Stratton.

In East Cornwall fruit-growing has assumed considerable dimensions, and now ranks amongst its most profitable industries. To a successful and well-known horticulturist to whose enterprise² the district owes much of its present prosperity, the writer is indebted for the following account of the industry.

The district in which cherries (mazzards), strawberries, and raspberries are largely grown comprises the land adjoining or within three miles of the Tamar, from Saltash to Horsebridge in Stoke Climsland; and embraces the parishes of St. Stephen's by Saltash, Botusfleming, Pillaton, St. Mellion, Landulph, St. Dominick, Calstock, and Stoke Climsland. Of the fruit grown, by far the most important is the strawberry, of which the annual output from the district named is, at present, from 200 to 300 tons. Next in importance is the raspberry, which produces from 100 to 150 tons annually, and realizes on an average about £21 per ton, the cost of gathering amounting to about 25 per cent. At the time of the fruit harvest work is so urgent that very high wages are paid, women and children earning 3s. and men 4s. per day. It is doubtful if cherry-growing has increased during the last thirty years. The cherry is the most uncertain of fruits, and, unlike other fruit,

² Mr. J. W. Lawrey, J.P., C.C., of Calstock.

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does not find a ready sale beyond the two westernmost counties.

In connexion with the cultivation of strawberries the punnet-making industry has attained to large dimensions. Almost all the fruit sold for dessert purposes is sent to market in small chip baskets (punnets) containing less than 1 lb. each. These are packed in cases which hold $4\frac{1}{2}$ dozen punnets. The demand for these latter is so great as to provide work for all the women and children of the district during the winter months. As the result of the fruit industry the rent of land suitable for the purpose has doubled and in some cases quadrupled in value. Both fruit-growers and labourers have prospered. As regards the latter, the high wages

earned by the men, supplemented by the earnings of their wives and children, enable them to live in a way unknown to the ordinary peasant. A beginning has also been made in the cultivation of tomatoes under glass, and the results obtained warrant the belief that it will be greatly extended. The effect of the fruit industry generally upon the intelligence of the people is also very marked. Besides educating the faculty of observation, the daily business done with persons at a distance has given the inhabitants a wider outlook than that possessed by those who only trade with their neighbours, so that, in every way, fruit-growing has proved a blessing to the entire district.⁵

THE FISHERIES

Although 'Mackrell' are mentioned by R. Carew¹ among the fish taken off the coast of Cornwall as early as 1602, the taking of them was apparently at that time a matter of small importance in comparison with the pilchard fishery. Dr. Borlase,² writing in 1758, mentions that 'the mackerel is taken in great plenty on the southern coast of Cornwall'; but it would seem, from his observation that the fish is 'not only of use when fresh, but is salted and pickled and kept all the winter to the great relief of the poor,' that there was no sale except in the immediate local market. This was, no doubt, due to the difficulties of transport.

The fact that such enormous quantities of these fish are to be found in the western waters in the spring must have been attracting attention very soon after Dr. Borlase's time, and the knowledge of this led to efforts to convey the fish to larger and more distant markets. In 1815 Dr. Paris³ remarked of Mousehole and Newlyn that 'the pilchard and mackerel fisheries are here carried on to a very great extent . . . and in the early part of the season they supply the London market with mackerel which are conveyed by way of Portsmouth.'

The trade thus once established grew steadily in importance, and as a consequence the boats engaged increased both in size and numbers, decked boats of 40 ft. keel and upwards taking the place of the smaller open or half-decked boats previously used. In 1850 a lugger large enough to carry 1,400 fathoms (more than a mile and a half) of nets was fitted out at Polperro.⁴ The opening of through railway communication between Penzance and London in 1859 naturally had a great effect on an industry to which quick transport is so essential. 'In 1860 fish to the

value of £80,000 was sent from the Land's End district to the London and large provincial markets.'⁶ Mr. Edmonds, writing in 1862, says 'there has never been so great a number of men employed in building large fishing boats in Mount's Bay as during the last year or two . . . the boats, too, which are now built are larger by some tons than their predecessors.'

About 1875 the number of boats engaged was between 300 and 400, including several from Lowestoft and other ports on the east coast of England, which had then recently begun to come west for this object. At that time the quantity of fish landed was on an average about fifty tons per day amounting to 3,000 or 4,000 tons for the whole season, while each boat carried from a half to three-quarters of a mile of nets. The number of boats coming from the east coast to take part has steadily increased, and since 1896 they have come from Yarmouth and other ports, as well as Lowestoft. During the last three or four years a large number of steam-boats from the east coast ports have taken part. These are much larger craft than the sailing boats, and carry as much as three miles of nets each.

The number of boats engaged in this particular fishery during the season of 1905 was estimated at 500, of which 20 hailed from

⁵ Beyond a few newspaper notices and magazine articles, very little has been written upon horticulture as a Cornish industry. For this reason the writer is especially indebted to the following gentlemen who have generously given him the benefit of their knowledge and experience in the composition of the foregoing article:—The Rev. A. T. Boscawen, of Ludgvan Rectory; Mr. J. C. Daubuz, of Killiow; Mr. Andrew Lawrey, of Varfell; Mr. W. M. Gluyas, of Scilly; Mr. J. W. Lawrey, of Calstock; and Mr. R. M. Martyn, of Padstow. To Mr. T. A. Williams, of the G.W.R. Office, Penzance, he is indebted for the statistics of the flowers and vegetables sent by train.

⁶ R. Edmonds, *The Land's End District* (1862), 226.

¹ R. Carew, *Surv. of Cornw.* 35.

² D. W. Borlase, *Nat. Hist. of Cornw.* 269.

³ *A Guide to Mount's Bay*, 72.

⁴ J. Couch, *The Hist. of Polperro* (1871), 113.

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Porthleven, 80 from Newlyn, 50 from Mousehole, 80 from St. Ives, and 270, of which the majority (more than 200) were steamers, from Lowestoft, Yarmouth, and the other east coast ports.

In quantities of fish the season of 1905 was unprecedented. The total value of fish of all kinds landed at Newlyn for the three months March, April, and May was £168,000. This includes trawl fish, but the mackerel represent probably at least three-quarters of the total, and this would mean about 30,000 tons of fish, giving an average of 400 tons or 600,000 fish per day.¹ In consequence of the enormous catches, the fish were selling on several occasions in May at 1s. per 120,² and large quantities were carted off for use as manure. In addition to the fish landed it was estimated that not less than 500,000, for which no sale could be obtained, in consequence of the glutted condition of the market, were thrown overboard from the fishing-boats into the sea.

This spring mackerel fishery, which has now become one of the great industries of England, is carried on by drift nets exclusively, and the habits of the fish which lead them to congregate in enormous numbers off the extreme south-western coast make Newlyn in Mount's Bay the natural headquarters and the fish market. The fish appear first at the end of February or the beginning of March to the south of the Lizard, and gradually move westward, until at the end of May they are found to the south and west of the isles of Scilly.

Mr. Pezzack reported that in the middle of May, 1905, the fish extended over an area of more than 100 miles west-south-west of the Wolf, and in such quantities that although the catches were enormous and continuous the shoal did not appear to diminish. In addition to the fish caught on the south and west which are landed at Newlyn, a considerable quantity are taken in the mouth of the Bristol Channel to the north-west of St. Ives by drift boats from that port. The season comes to an end with the month of May, when the great mass of fish disappears. In some years they come off the coast again in the autumn in sufficient quantities to enable the large boats to use their drift nets.

There are altogether in the ports of Cornwall about 300 boats engaged in the mackerel drift-net fishery, of which about sixty are east of the Lizard, 150 in Mount's Bay, and eighty at St. Ives.³

Mackerel appear in considerable quantities

¹ These figures are from the report of Mr. J. Pezzack, the fishery officer of Cornwall County Council.

² Mackerel are always counted by the 'hundred,' which contains 120 fish, or in large quantities by the 'last,' which contains 10,000. They are sold by the 'hundred.'

³ Mr. Pezzack's Report.

near the shore in the bays on the south coast during the summer in small schools, each of which is a number of fish from 5,000 down, travelling in a crowd huddled together. They are then caught in seines made and kept for the purpose. Unlike the drift fishery, most of the mackerel seine fishery is to the east of the Lizard, and out of some forty-seven seines thirty-one are at these ports and sixteen in Mount's Bay,⁴ and none at St. Ives. In addition to these large industries mackerel, which are to be caught all the year round, are taken on hand lines, but the quantity landed from this source is insignificant, and is readily absorbed in the locality where they are caught.

The pilchard fishery, which is now second in importance to the spring mackerel fishery, was until about thirty years ago the most important, as it is by far the oldest. There is no record of its origin, but in 1594 it was of sufficient importance to be recognized in an Act of Parliament (35 Eliz. c. xi), which provided that no stranger should transport any 'pilchers' or other fish in cask unless such person should previously have brought in a proportionate amount of 'Clapboard fit for cask or else of Cask.'

Richard Carew⁵ mentions that in his time pilchards were exported to France, Spain, and Italy. He gives no figures of the quantity of fish caught or exported, but he states clearly that 'the deare Sale beyond the seas' affected both the supply and the prices in the local markets. In more recent times the bulk of the export trade has been to Italy. The fishery flourished steadily through the seventeenth and the eighteenth centuries, and Dr. Borlase, in 1758, after a short account of the method in which the fish were caught, wrote concerning the pilchard that 'ships are often freighted hither with salt, and into foreign Countries with the fish carrying off at the same time part of our tin.' The usual produce of this beneficial article in money is as follows:—By an exact computation of the number of hogsheads exported each year for ten years, from 1747 to 1756 inclusive, from the four ports of Fawey, Falmouth, Penzance, and St. Ives, it appears that Fawey has exported yearly 1,732 hogsheads, Falmouth 14,631½, Penzance and Mount's Bay 12,149½, St. Ives 1,282; in all amounting to 29,795 hogsheads. Every hogshhead for ten years last past, together with the bounty allowed for each hogshhead exported, and the oyl made out of each hogshhead, has amounted, one year with another at an average, to the price of one Pound sixteen shillings and threepence, so that the cash paid for pilchards exported has at a medium annually amounted to the Sum of £49,532 10s.⁶

Pilchards have always been counted by the hogshhead, and the uncertainty as to the exact

⁴ Ibid.

⁵ R. Carew, *Surv. of Cornw.* 33.

⁶ Borlase, *Nat. Hist.* 273.

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size of this measure at different times makes it somewhat difficult to compare the figures of one period with those of another. About 1600 the contents of the hogshead were apparently measured by the number of fish, for Richard Carew¹ says that 'on packing they keepe a juste tale of the number that every hogshead containeth, which otherwise may turn to the marchants prejudice: for I have heard that when they are brought to the place for sale, the buyer openeth one hogshead at adventures; and if hee finde the same not to answere the number figured on the outside he abateth a like proportion in every other, as there wanted in that.'

But the traditional size of a hogshead of pilchards is $4\frac{1}{4}$ cwt.² when packed, and as the oldest of the fishermen learnt this from their fathers and grandfathers, it may be fairly assumed that the hogshead of Dr. Borlase's time was of this capacity. It contains about 3,000 fish, and this gives an annual average export in the middle of the eighteenth century of more than eighty-nine millions of fish.

One hundred years later the average annual export was 21,732 hogsheads,³ or about sixty-five millions of fish. In 1847 the total was 40,883 hogsheads (122 millions of fish), which is probably the largest on record for a single year.

In consequence of a decreasing demand for the fish by Italian markets, and an increase in the pilchard fishery off the north-west coast of Spain, the export from Cornwall has diminished to a great extent in the last thirty years. The fish are still plentiful enough, and, as Mr. T. Cornish said in 1883,⁴ 'we could easily find thirty or forty millions of fish for the supply of a fresh fish market without feeling the loss of them.'

The pilchard is a small fish of the 'herring' family, generally about ten inches long, and less than half a pound in weight. Although it is occasionally caught off Exmouth and Seaton in South Devon, it practically confines itself to the coast west of the Start Point in Devonshire and Trevose Head in Cornwall. In these waters it usually appears in July, coming from the west in large schools. A small quantity of scattered fish are sometimes taken in the drift nets in June.

During July the bulk of the fishery is in Mount's Bay; in August and September, in Mount's Bay and to the east of the Lizard; and in September and October, chiefly off St. Ives and the north coast.

It is caught both in drift nets and in seines, and the methods in use to-day are the same as those which were in use 300 years ago. In 1602 R. Carew wrote that 'the Drouers hang certain

square nets athwart the tide thorou which the schoell of pilchard passing leave many behind entangled in the meshes'; a short but accurate description equally applicable to the drift fishery now.

It would seem from his remark that 'the Sayners complayne with open mouth, that these drovers worke much prejudice to the common wealth of fishermen and reape thereby small gaine to themselves; for (say they) the taking of some few breaketh and scattereth the whole Schools and frayeth them from approaching the shore . . .,' as though the drift fishery was at that time a comparatively new thing, but he does not say so definitely. As the pilchard fishery is everywhere conducted close to the shore, and in the bays on the coast, the boats engaged in the drift-net work are much smaller than the mackerel drivers, being usually about thirty feet long; even smaller boats are sometimes used, and the men go out driving in the fine summer evenings in open hookers or gigs of as little as twenty-two or twenty-five feet.

St. Ives has the largest number of these pilchard drivers, the total being about 200. A large number of these come to Newlyn in July, as at that time the fish are more plentiful on the south coast, returning to St. Ives in August, as the quantity of fish increases on that side of the land.

The Mount's Bay ports have about 170 boats (Porthleven 90, Mousehole 50, Newlyn 30), and there is a goodly fleet of about 60 at Port Isaac, which are largely engaged in pilchard driving in the autumn. In the ports east of the Lizard there are altogether about 100⁵ (Polperro 40, Mevagissey 30, Looe 20), and many of these boats are also used for the local mackerel drift fishery, which is not the case west of the Lizard, where the smaller boats are not suitable.

The pilchard seine fishery is even more of an inshore fishery than the drift. The seines are of the same kind as are used everywhere, but have a smaller mesh than those used for mackerel, and the method of saving the fish is slightly different. In catching mackerel the seine, when shot round the school, is towed into shallow water, and the foot of the net hauled up into the seine boat so as to enclose the fish in the net itself; but the enormous size of a school of pilchards,⁶ compared with one of mackerel, makes this method impracticable in dealing with the local fish. When the fish are safely surrounded by the seine,

⁵ Mr. Pezzack's Report.

⁶ A school of mackerel averages from 2,000 to 5,000 fish. A school of pilchards on the south coast (i.e. in the early part of the season) averages less than 500 hogsheads, or 1,500,000 fish; on the north (i.e. the later part of the season) they are usually larger. The greatest recorded number taken in one seine was at St. Ives in 1868, when 5,600 hogsheads, or more than 16,500,000 fish, were saved. Almost as many were taken there in one seine in 1851.

¹ R. Carew, *Surv. of Cornw.* 33.

² Of recent years the fish have been packed in 'half-hogsheads,' each containing 236 lb.

³ *Trans. Penzance Nat. Hist. Soc.* i, 444.

⁴ 'The Mackerel and Pilchard Fisheries.' International Fisheries Exhibition Conference, 1883.

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another net called the 'tuck-net' is passed under the fish inside the seine itself, and the fish are lifted bodily to the surface and so taken into the boats.

At all the chief places of the pilchard seine fishery the local fishing ground is divided by shore marks into regular areas or 'stems,' and the boats take up their stations on these 'stems' in regular rotation. When a school of fish comes into the 'stem' the boat whose turn it then happens to be has the first right to shoot her net. This custom, intended to prevent quarrelling amongst the seiners, was of great service in the days when there were large numbers of pilchard seines in use, and is enforced at St. Ives by an Act of Parliament.¹

The seine fishery for pilchards has declined very largely in the last twenty or thirty years, and there are now fewer boats engaged in the whole county than there formerly were at St. Ives alone. The total now is about forty-four, of which ten are at St. Ives, twelve at Cadgwith and Mullion on either side of the Lizard, the only four in Mount's Bay are at Porthleven, there are nine in the coves near Falmouth, and single ones at Penberth, Porthgwarra, and Newquay, and six at Sennen, whose fishing ground is in Whitsand Bay, near the Land's End.²

The fish intended for export were until recently prepared by a method known as 'bulking,' which had been used for more than 300 years; they were placed in the fish cellars in layers with alternate layers of salt, and pressed with heavy weights until the oil and blood were driven out, which result was attained in two or three weeks. The fish were then taken out and washed and packed in hogsheads and again pressed. For some years now it has become the more usual practice to put the fish with salt into large tanks and leave them for some two or three weeks until they are thoroughly pickled, instead of 'bulking,' and to press them with screw presses when they are in the hogsheads.

The oil, of which the pilchard contains an enormous quantity in proportion to its size, is collected in tanks, and finds a steady sale in English markets.

The fish, when packed in this manner, are called locally 'fermades' (fumados), a name derived from the fact that at one time they were smoked; the term still survives, although that method of curing went out of use more than 300 years ago.

R. Carew,³ after describing the custom of 'bulking,' which was the same in his time (1602) as it is now, adds 'those that serve for the hotter Countries of Spaine and Italie they used at first to fume by hanging them up on long sticks one by one in a house built for the nonce, and there drying them with the smoake of a soft and con-

tinuall fire, from whence they purchased the name of fumados; but now, though the terme still remaine, that trade is given over . . . ' and the fish were packed in hogsheads just as they are to-day.

The herring is an inhabitant of the cold water, and is not found off the coast of Cornwall in such quantities as in the northern and eastern waters of England. In fact Cornwall lies across the extreme southern limit of the range of this fish so exactly, that whereas there is a regular herring fishery from the ports on the north coast, especially Port Isaac and St. Ives in the late autumn, it is only occasionally that they are taken in any quantity on the south coast. It is curious that the southern limit of the range of the herring is so closely identified with the northern limit of the range of the warm water pilchard. St. Ives is the chief centre of the Cornish herring fishery, and there the average annual export amounts to about 2,000 tons, or perhaps six millions of fish. They are caught exclusively in drift nets, and usually in the larger boats, but in some seasons the fish are so near the shore that open boats and large gigs can be used. The fish are sent to English markets by rail.

The common shellfish, crab, lobster, and crayfish, are caught all round the coast, and the fishing employs about 370 boats, the majority of which (about 250) are in the ports east of the Lizard on the south coast, the largest number being at Mevagissey. This distribution of the fleet is probably due not to any absence of the fish from the western or northern waters, but to the fact that the sea to the east of the Lizard is more sheltered, and not so continuously troubled by the great seas and strong tides which make fishing in small open boats so precarious off the cliffs and headlands of the south-western and northern shores. Of late years a considerable number of French fishing boats from the neighbourhood of Brest have been employed in taking shellfish in the deep waters off the coast, especially between the Land's End and the isles of Scilly, with success. These are decked boats of about twenty or thirty tons, while the local boats are usually open boats of about twenty-five feet in length. The fish are caught in crabpots, those made of withy being most commonly used. The season is confined to the summer months.

The grey mullet has a habit of congregating in an enormous school at Whitsand Bay, by the Land's End, and sometimes in the smaller bights of the coast between that and St. Ives, in the winter months. The fish are often seen lying for many days in some inaccessible place under the cliffs, and the men wait until the school moves into shoaler water over a sandy bottom where they can shoot a seine. A catch when it occurs is a great boon to the local fishermen, as the fish are taken in many thousands and sell for as much as 10d. or 1s. each at the boat side, and

¹ 4 & 5 Vic. c. 57.

² *Mr. Pezzack's Report.*

³ Carew, *Surv. of Cornw.*

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this at the time of the year when no other fishing is possible. The fish are exported to French markets.

The deep-sea trawling off the coast is carried on chiefly by the large trawlers from Plymouth and Brixham, and much fish from this source is landed at Newlyn in the spring and early summer; but many of these boats, which are much larger than those of the local fleets, carry their catches to their home ports. A small amount of trawling is done by local boats near the shore, especially in Mount's Bay.

Trammels are chiefly used by the crabbers to catch Ballan Wrasse (locally known as John Ray or Jocky Ralph) and other coarse fish for use as bait in the crabpots, but the surmullet, pollack, and other high-class fish caught command a ready market.

There is a small number of boats employed in fishing with boulders, catching considerable

quantities of the large pollack (a fish which reaches a size of as much as 15 or 16 lb., and is locally esteemed a great delicacy) and conger, with other bottom fish.

The oyster fishery in the Helford estuaries and the several creeks of the Fal was at one time a large and remunerative industry, but from various reasons has fallen off very considerably. Of late years there has been a fair improvement, and about twenty-five boats are engaged more or less regularly at the work.

With the exception of Falmouth, where the boats used are the well-known yawl-rigged Kea punts, and Mevagissey and Polperro, where many of the boats are cutter-rigged, the Cornish fishermen, as a whole, adhere to the old-fashioned dipping lugsail for their boats, in defiance of the common opinion that the inconvenience of working these sails more than outweighs their undoubted sailing qualities.



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of local mines. Mr. Thomas died in 1861, leaving the works to his two sons, James and Edwin Thomas. After the death in 1880 of the former, who survived his brother, the works were carried on by the beneficiaries until 1884, when they were purchased by Mr. Martyn of St. Austell, for the purpose of starting them under a limited liability company. The present company was accordingly formed, and by them the works were greatly enlarged and improved, and a bridge-building department added, with modern appliances and tools. Owing, however, to the heavy carriage expenses of sending bridges long distances this part of the business was not remunerative and was abandoned, the plant being utilized for boiler-making. A good business is done in large Lancashire and Cornish boilers for the china clay works and local mines, and for Plymouth.

The works are well equipped, and are capable of dealing with the entire engineering requirements of the mines, and more particularly of the china clay industry. Mining machinery of every description is manufactured, besides bridges, roofs, girders, tanks and other constructional iron work.

Bartle's Foundry was established about the year 1860 by Messrs. Bartle, William Dunkin, Thomas Henry Tregoning and Joseph Lugg, at Carn Brea, the centre of a busy and populous

district, and in the midst of mines for the purpose of supplying the latter with general foundry and iron work.

By dint of hard work a good business was formed. After a few years Mr. Lugg retired, and the concern was carried on by the remaining partners until the year 1884 when, owing to disagreement, it was suspended and was offered for sale. Mr. F. Bartle, one of the founders, became the purchaser, and with his sons, Mr. Charles D. Bartle and Mr. William Bartle, who returned from America for the purpose, has carried on the business ever since under the title of F. Bartle & Sons.

The works have been enlarged, and the business considerably developed, being well known in the mining world. The persons employed number from 70 to 100.

The manufactures include the Murdoch Rock Drill and tube mills. The patent of the latter was held by this firm, and was formerly known as the Barrel Pulverizer. Michell and Tregoning's Pulverizers are also made; large numbers of both kinds are working in Cornwall and other places. The firm also make a speciality of slime-dressing machinery, and have just patented an improved Slime Concentrator. They are also well-known makers of double faggoted iron, large quantities of which they send to South Africa.

CHINA CLAY

No account of Cornish Industries can claim to be complete which does not include a sketch, however brief, of that industry which is, and has always been, since its inception about the middle of the eighteenth century, the most uniformly progressive of them all.

The causes, mechanical and chemical, which have led to the formation of china clay are well known. On the one hand, variations of temperature and the congelation and consequent expansion of water within the minute pores of granite rock; on the other, the concurrent chemical action of carbonic acid, robbing the felspar and mica contained in the granite of their potash; these are commonly held to have been the chief causes of that process of disintegration by which china clay, or kaolin, has been formed.¹

Wherever in Cornwall there is a granite formation—the Carnmenellis district excepted—china clay has been formed. West Penwith, Breage, the moors north of Bodmin, all contain deposits; but by far the most considerable as well as the most valuable clay beds are those of the Hensbarrow district which embraces large portions of the parishes of St. Austell, St. Blazey,

Luxulian, Roche, St. Denys, St. Enoder and St. Stephen in Brannel.

About the middle of the eighteenth century the presence of this valuable product became known to the potter. Mr. William Cookworthy, who had established a pottery in Plymouth in 1733, obtained in conjunction with Lord Camelford a patent for the use of china clay in 1768. In 1813 there were seven clay beds being worked in the Hensbarrow district, the largest of which produced about 300 tons of clay per annum.² The amount of china stone shipped at Charlestown in 1816-17 was 2,135 tons, and of china clay 1,775 tons.³ Since that time the returns have steadily increased, as will be seen from the following table⁴ :—

| Year. | China Clay. | China Stone. | Total. |
|--------|-------------|--------------|----------------------|
| 1816 . | 1,775 | 2,135 | 3,910 ³ |
| 1826 . | 7,538 | 5,252 | 12,790 ³ |
| 1838 . | 13,440 | 7,344 | 20,784 ³ |
| 1855 . | 60,188 | 19,961 | 80,149 ⁴ |
| 1864 . | 95,730 | 21,570 | 117,300 ⁴ |
| 1874 . | 150,500 | 42,500 | 193,000 ⁴ |
| 1894 . | — | — | 386,648 ⁴ |
| 1903 . | 490,881 | 53,680 | 544,561 ⁴ |
| 1904 . | 515,451 | 66,994 | 582,445 ⁴ |

² *Annals of Philosophy*, vol. ii, p. 475.

³ *Trans. of the Geol. Soc. of Cornwall*.

⁴ *Mineral Statistics*, published by the Home Department.

¹ It should be mentioned that a very competent writer, Robert Hunt, F.R.S., considers china clay to be granite which has never properly been formed, rather than granite which has undergone decomposition, See *British Mining*, p. 196.

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For the purpose of raising the china clay to the surface and preparing it for export, the following method is generally adopted, allowance being made for such modifications as the nature of the locality and economical working require. A shaft having been sunk to the required depth alongside the deposit, a level is then driven underneath the clay which is to be raised. From the level thus made another shaft or 'rise' is carried, through the clay, to the surface. The overburden of earth and foreign matter having been removed, a square wooden pipe or 'launder' is inserted in the 'rise' which is then filled up with clay. This 'launder' is furnished at intervals with holes which, until occasion requires, are kept closed. Arrangements having been made for the supply of a small but continuous stream of water to the clay bed, the surface of the clay bed is now broken up with picks so as to enable the clay to mix readily with the water. The water, holding the clay in suspension, is then carried down the 'launder' and along the level to the shaft, whence it is pumped to the surface. The milk-white liquid is next conveyed by a series of channels to the clay pit, the channels being so arranged, and the rate of flow so regulated by hatches, as to ensure the deposition of all the heavier particles of sand and mica on the way. In the clay pit the clay is allowed to settle and the water is drawn off, to be used over again for the same purpose. From the pit the clay is 'landed' into an adjacent tank by the removal of a plug near the bottom of the pit. While in the tank the surface water is drawn off from time to time until the clay assumes the consistency of thick cream. From the tank the clay is conveyed to the kiln, where it is cut up into squares, and the remaining moisture driven off by the application of artificial heat. It is now ready for transit.

The uses of china clay are various. It has been stated, on good authority, that probably not more than one-third of the clay now produced is used in the manufacture of porcelain. In the sizing of cotton goods and in paper-making—for the purpose of adding weight and consistency; and in the manufacture of alum, ultramarine, crayons, water colours, and other similar products, vast quantities of china clay are required, both at home and abroad. Besides supplying the home markets, the chief of which are the Staf-

fordshire Potteries and Lancashire, there is a considerable export to the United States, Holland, Belgium, Italy, Spain, France, Germany, and Austria.

A good clay-bed will produce from 1 to 2½ tons of clay to every cubic fathom. The selling price of china clay per ton is from 13s. to 25s.; but the larger amount consists of medium clays. The official estimate of the value of the output for the year 1904 was evidently calculated upon a much lower selling price, for the purpose, doubtless, of including inferior products, mica-clay, etc. Even so, considerably over £320,000 was realized by the merchants in that year, and there are at present no signs of a decline.

China Stone is granitic rock consisting of quartz, decomposed felspar, and white mica. It occurs chiefly in the parishes of St. Austell, St. Denys, and St. Stephen in Brannel, and has long been used in these and in the neighbouring parishes for building purposes. The towers of Probus and St. Stephen's churches are built of china stone. In 1817 the amount shipped for the manufacture of pottery exceeded that of china clay; but of recent years, although the output has steadily increased, it has formed less than one-eighth of the whole. Its price varies, according to the quality of the stone, from 8s. to 12s. per ton. China stone is obtained by quarrying, and before being used, requires to be finely ground. The grinding is sometimes performed in Cornwall, but usually it is done at the potteries, where also an addition of felspar and other ingredients is made to meet the requirements of the particular ware it is sought to manufacture.¹

¹ A carefully written and exhaustive account of the 'Hensbarrow Granite District' by J. H. Collins, F.G.S., appeared in 1878. To this and to the mineral statistics published by the Home Department, and also to Mr. F. N. Olver of St. Just for advice, the present writer is chiefly indebted for the foregoing sketch. Much interesting matter may be found in 'A Treatise on China Clay,' by David Cock. The chapter devoted to this industry by Mr. Brenton Symons, F.C.S., in his 'Geology of Cornwall,' is for the most part a verbatim reprint of the account given by Mr. Collins, to whose work the reader is referred for a fuller treatment of the subject.

HORTICULTURE

The warm and equable climate rather than the nature of the soil of the south-western portion of Cornwall and of the isles of Scilly has within recent years led to the extensive cultivation of flowers for the London and other markets. Inasmuch as this particular industry has grown up within living memory, it becomes necessary to indicate briefly the successive

steps which have led to its present importance. The home of the industry is Tresco, one of the islands of Scilly, and its parent and prototype, the narcissus. Various theories have been propounded to account for the presence, from time immemorial, of some half-dozen varieties of this flower, chiefly at Holy Vale and at Tresco. Whether these were introduced by some mem-

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ber of the great family of Blanchminster, whose castle was at Enor and prison at La Val,¹ or by the Benedictine monks who had a cell at Tresco,²

These other flames,

The spirits of men contemplative, were all
Enliven'd by the warmth, whose kindly force
Gives birth to flowers and fruits of holiness.³

or, at some later period, perchance by some officer of the garrison stationed at St. Mary's, it is now impossible to determine. But there the flowers were, and there they flourished luxuriantly. The isolation of Scilly had always thrown the inhabitants largely on their own resources. For generations their only marketable commodity was kelp, which they obtained in large amount by burning the ore-weed which has always been very abundant on the rocky shores of the islands. The kelp industry was ruined by a right of pre-emption which was claimed by the lord proprietor and injudiciously exercised by his steward, and also by the discovery of chemical substitutes for kelp. Various attempts were made to introduce fisheries, but all these proved abortive. The cultivation of early potatoes followed and was attended with success, but it also served to remind the Scillonians of their extremely precarious means of subsistence. A hard frost or a sudden gale meant the utter destruction and loss of the crop. In or about the year 1870, Mr. Augustus Smith, lord proprietor of the isles of Scilly, advised some of his tenants to send a consignment of narcissus flowers to Covent Garden market. The credit of acting upon this advice is shared between Mr. Richard Mumford of Holy Vale and Mr. William Trevellick of Rocky Hill. The first consignment was small and realized only £1. Thenceforward, however, for a few years, at Tresco Abbey gardens and on a few farms, flowers were cultivated, but with

indifferent success. In 1880 flower culture first became remunerative on a small scale. In 1883 Mr. T. A. Dorrien-Smith, nephew of Mr. Augustus Smith, who had succeeded his uncle as lord proprietor, determined to study closely the cultivation of the narcissus, and for this purpose he visited Holland, Belgium, and the Channel Islands. Finding that the flowers were a month earlier in Scilly than in those places, he purchased bulbs largely, for himself and for his tenantry. The export of flowers, from the Scilly Isles alone, rose in 1885 to 65 tons. The amount was 100 tons in 1887, and has continued to increase, with slight fluctuations, the returns for the last few years having been as follows:—⁴

In 1901 the export amounted to 650 tons.

| | | | | | |
|--------|---|---|---|-----|---|
| „ 1902 | „ | „ | „ | 750 | „ |
| „ 1903 | „ | „ | „ | 700 | „ |
| „ 1904 | „ | „ | „ | 800 | „ |
| „ 1905 | „ | „ | „ | 700 | „ |

On the mainland the cultivation of the narcissus for the market was first undertaken by Mr. Andrew Lawrey of Varfell, in the parish of Ludgvan, in the year 1885. Since that date flower farms have been formed in the parishes of St. Burian, Gulval, Lelant, Madron, Mylor, and Paul, but Varfell continues to occupy a leading position both for flowers and vegetables in West Cornwall.

On the islands little is done by way of manuring the land for narcissus, the chief thing being the separation, removal, and transplanting of the bulbs every three years to prevent deterioration. On the mainland, however, sea-weed and bone meal are extensively used. It is also claimed that the heavier soil of Ludgvan and elsewhere produces more robust plants and better blooms than the sandy soil of the islands. In order to protect the flowers from the fierce equinoctial gales the land is cut up into rectangular strips, and these are surrounded by hedges of veronica, escallonia, and privet. The flower harvest begins on the islands in January, and continues until the end of May. On the mainland it is, roughly speaking, ten days or a fortnight later. This affords employment to great numbers of men, women, and children. The flowers are gathered and tied up in bunches of twelve each, and are then packed in boxes and sent to most of the large towns of the United Kingdom. The price of the flowers varies; early in the season a dozen bunches will fetch as much as 3s. or 4s., late in the season the price will sometimes be less than one-third of that sum. The narcissus is not cultivated extensively under glass except at Tresco, where a flower crop, followed by tomatoes, has proved very remunerative. The varieties of the narcissus which may be considered indigenous to

⁴ The writer is indebted to the Great Western Railway for these returns.

¹ Pat. Roll, 3 Edw. II, May 10.

² This conjecture, which has hitherto been based solely upon the known habits and tastes of the Benedictine monks, receives some support from the fact that also on the slopes of St. Michael's Mount the variety of the narcissus known as the Scilly White, which grows wild in Scilly, has flourished from time immemorial. Until the reign of Henry IV the monks of St. Michael's Mount and those of Tresco were of the same order—the order of St. Benedict. It was Henry V who granted St. Michael's to the abbess and convent of Syon (*Cal. of Pat. 2 Henry VI*, p. 205). Assuming therefore a Benedictine origin for the flower, its introduction to Scilly and St. Michael's Mount must have taken place in or before the beginning of the fifteenth century. From recent enquiries which the writer has caused to be instituted at the Jardin des Plantes it would appear that the Scilly White is also found growing wild on Mont St. Michel, the seat of the original foundation of the Benedictine order—a further corroboration of the theory that the Benedictines introduced the narcissus into Cornwall.

³ Dante, *Paradise*, xxii, 44.

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Scilly are:—The *Scilly White*, and the old English *daffodil* (both of which grew in abundance at Holy Vale, Newford, Trenoweth, and elsewhere on the islands), and *Grand Monarque*, of which great quantities were to be found on Garrison Hill. For some years the only other varieties cultivated were:—*Soleil d'or*, *Glorioso*, and *Ornatus*. Every year, however, brought fresh cultivators into the field, and new varieties to the stock, which now number over 200. The chief varieties in addition to those already mentioned, which are extensively grown, are:—*Sir Watkin*, *Horsfeldii*, *Emperor*, *Empress*, *Sir Henry Irving*, *Princeps*, *Golden Spur*, and *Incomparabilis*. Of these *Princeps* and *Incomparabilis* crop heavily only once in three years. Time brings its revenges, and Holland which formerly supplied the bulk of the bulbs for Cornish cultivation is now a large importer of Cornish bulbs. The Cornwall Spring Show in April, and the Scilly Flower Show, which formerly took place in March, have done much to encourage this industry both by calling attention to the beauty and perfection of the flowers grown in Cornwall, and by introducing Cornish growers to new varieties of the narcissus.

The narcissus is not the only flower grown for sale. Before its cultivation was seriously resolved upon, the wall-flower had been profitably grown for years. At the present time besides wall-flowers and narcissi (and, to a much less extent, tulips, freesias, hyacinths, ixias, and sparaxis), the gladiolus, iris, and violet on the mainland, and the arum, marguerite, and blood-red anemone on the islands, are grown in great profusion. Moreover there is good reason to believe that owing to its mild and salubrious climate the inhabitants of West Cornwall especially will in years to come be drawn more and more strongly towards an industry which already affords employment to a very large number of persons of both sexes, and which, involving as it does the constant exercise of the powers of observation and no little scientific knowledge, seems eminently suited to the genius of the Cornish people. That it can become a source of considerable profit, wherever intelligence and industry are found combined, is beyond question.

So far the cultivation of flowers has been treated exclusively as a source of profit. Without going into detail, however, it may be allowable, at this point, to call attention to the exceptional interest which attaches to the gardens of some of the larger country seats in the county. The same conditions which have contributed to the profitable cultivation of flowers have also contributed to the singular success which has attended the efforts of those who have grown flowers and shrubs as a source of pleasure and recreation, and as affording a subject for scientific study. Wherever the gardener's art is allowed free scope, pretty and picturesque effects can always be obtained; but in Cornwall some-

thing more than this has been attempted and has been achieved. The magnificent collections of rhododendrons (*sikkims*) and other effective trees and shrubs at Tregothnan, Heligan, Killiow, Carclew, Tremough, and Pentillie Castle (which is also famed for its azaleas), the flowering sub-tropical shrubs and orange trees of Mount Edgcombe, the sub-tropical shrubs and plants of Tresco, Menabilly, Killiow, Trewidden, and Penjerrick, the herbaceous and Alpine plants of Trehane and Ludgvan Rectory, the flowering shrubs and tree ferns of Caerhayes and Bosahan; these are but a few of the many gardens in Cornwall which bear witness to the perseverance, enterprise, and knowledge of the owners of those famous houses.

Equally important, if somewhat less interesting, is the cultivation of vegetables. The West Cornwall potato trade has been in existence since the year 1820, but it is only within the last twenty-five years that market gardeners have given special attention to it. It is noteworthy, however, that as soon as their efforts were directed towards the growing of early potatoes they met with complete success. The fact that potatoes could be produced in the open eight or ten weeks earlier in Scilly than in the Midland counties led to extensive operations, not only on the islands but also on the sunny southern slopes of West Cornwall. At first round potatoes were tilled, but very soon these gave place to Myatt's Early Ashleaf and other modern varieties. The seed potatoes usually arrive in October. They are immediately placed in a storeroom to shoot, and are planted in January and February. On the islands fishing nets are used as a protection against the devastating winds which sweep across the islands in early spring. The potato season extends from the beginning of May to the end of June. The average yield per acre on well-cultivated farms of elvan soils amounts to 10 tons in May and to 14 tons in June. On the islands, however, it is much less. The crop depends largely upon the amount of manure supplied, a ton of guano and 160 loads of dressing to the acre being used where a heavy crop is expected. The cultivation of potatoes under glass is not generally adopted. Now that steam navigation has replaced the slower methods of transit and the cost of freight is so small, a supply of early potatoes, grown in the open, can be procured from abroad for the greater part of the year; and hence there is no likelihood of artificial modes of cultivation ever becoming general. The railway company's returns, hereunder given, represent approximately the potato crop of West Cornwall for the years referred to:—

| | Tons sent off by train. |
|----------------|-------------------------|
| 1901 | 4,600 |
| 1902 | 6,100 |
| 1903 | 6,300 |
| 1904 | 5,200 |

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No sooner has the potato crop been gathered than preparations are made for the planting of cauliflower and broccoli.¹ This accordingly takes place from the middle to the end of June, the seeds having been sown about the middle of March. A continuous supply of these vegetables is secured from November to April by selecting several varieties of seed. For the successful cultivation of broccoli, heavy soil is chosen and ammoniacal manure is used. Reckoning 100 crates to the acre, and 14 crates to the ton, land suitably chosen will yield between 7 and 8 tons to the acre. The farmer seldom gathers his own broccoli harvest. It pays him better to receive £15 to £20 per acre for the standing crop than to cut, pack, and send it off in crates; while at the same time the buyer, whose operations usually extend over a wide area, is enabled to meet the demands of the markets by a steady and constant supply. The amount of broccoli from West Cornwall (chiefly from the parishes of Gulval, Madron, Paul, Lelant, Ludgvan, St. Ives, and St. Burian) during the last five years is supplied by the following table :—

| | Tons of broccoli sent off by train. |
|----------------|--|
| 1901 | 16,900 |
| 1902 | 15,200 |
| 1903 | 17,000 |
| 1904 | 14,400 |
| 1905 | 19,100 |

From this it will be seen how extensively this vegetable is cultivated and also that its cultivation is steadily increasing.

Asparagus is grown successfully at Tregirls, near Padstow, at Varfell in Ludgvan, and, on a smaller scale, in a few other places. Lack of capital deters many from engaging in this very profitable industry. Four years—the time required for the plants to mature—is considered too long a time to wait for a return. At the same time, it is agreed by all who have given attention to the subject, that the deep sandy loamy soils bordering the Cornish coast, well manured from time to time with seaweed and shell sand, are especially adapted for the culture of asparagus; and here it may be noted that seaweed as a manure is valuable for every crop, and is very extensively used by market gardeners. It requires to be buried immediately, otherwise the potash, its chief fertilizing ingredient, escapes.

¹ A note in the *Bath and West of England Journal*, by the late Rev. Thomas Phillpotts, of Porthgidden, explains the origin of this industry. It states that Mr. Dupen, of Hayle, in the year 1836, took to Bristol, in a boat which plied between those ports, 4 dozen of broccoli and sold them at a profit. On his next voyage, in the same year, he took 14 dozen. In the following year one Temby, of Redruth, bought a consignment of broccoli from Benjamin Roberts, of Boscathnoe, and disposed of the same in London.

At Tregirls asparagus farm as much as 7s. 6d. has been obtained for early cuttings of 100 sticks, and the price seldom falls below 2s. At Varfell 100 sticks have been known to weigh as much as 16½ lb.

Seakale is another vegetable which thrives in Cornwall. It has been and is still grown in various places with good results.

Tomatoes, owing to the humidity of the atmosphere, seldom ripen in the open; but under glass, following an early crop of flowers or other vegetables, they have been found profitable.

Formerly cucumbers yielded a large margin of profit, as much as 20s. a dozen having been obtained; but now, owing to the general introduction of glass-houses, the supply has increased and the price is no longer sufficient to induce gardeners to devote much attention to their cultivation.

Fruit-growing is also an important industry. In West Cornwall it has never been extensive, and is probably declining. The raspberry has suffered from the weevil pest, and the strawberry and currant are less cultivated than they were fifty years ago. In Kea parish the plum orchards are still famous both for the black Kea plum, which is peculiar to that parish, and also for red and grey varieties, the latter of which resembles the greengage, though somewhat smaller, and is valuable principally because it is the first to ripen. Apples are grown chiefly in the hundred of Stratton.

In East Cornwall fruit-growing has assumed considerable dimensions, and now ranks amongst its most profitable industries. To a successful and well-known horticulturist to whose enterprise² the district owes much of its present prosperity, the writer is indebted for the following account of the industry.

The district in which cherries (mazzards), strawberries, and raspberries are largely grown comprises the land adjoining or within three miles of the Tamar, from Saltash to Horsebridge in Stoke Climsland; and embraces the parishes of St. Stephen's by Saltash, Botusfleming, Pillaton, St. Mellion, Landulph, St. Dominick, Calstock, and Stoke Climsland. Of the fruit grown, by far the most important is the strawberry, of which the annual output from the district named is, at present, from 200 to 300 tons. Next in importance is the raspberry, which produces from 100 to 150 tons annually, and realizes on an average about £21 per ton, the cost of gathering amounting to about 25 per cent. At the time of the fruit harvest work is so urgent that very high wages are paid, women and children earning 3s. and men 4s. per day. It is doubtful if cherry-growing has increased during the last thirty years. The cherry is the most uncertain of fruits, and, unlike other fruit,

² Mr. J. W. Lawrey, J.P., C.C., of Calstock.

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does not find a ready sale beyond the two westernmost counties.

In connexion with the cultivation of strawberries the punnet-making industry has attained to large dimensions. Almost all the fruit sold for dessert purposes is sent to market in small chip baskets (punnets) containing less than 1 lb. each. These are packed in cases which hold $4\frac{1}{2}$ dozen punnets. The demand for these latter is so great as to provide work for all the women and children of the district during the winter months. As the result of the fruit industry the rent of land suitable for the purpose has doubled and in some cases quadrupled in value. Both fruit-growers and labourers have prospered. As regards the latter, the high wages

earned by the men, supplemented by the earnings of their wives and children, enable them to live in a way unknown to the ordinary peasant. A beginning has also been made in the cultivation of tomatoes under glass, and the results obtained warrant the belief that it will be greatly extended. The effect of the fruit industry generally upon the intelligence of the people is also very marked. Besides educating the faculty of observation, the daily business done with persons at a distance has given the inhabitants a wider outlook than that possessed by those who only trade with their neighbours, so that, in every way, fruit-growing has proved a blessing to the entire district.⁵

THE FISHERIES

Although 'Mackrell' are mentioned by R. Carew¹ among the fish taken off the coast of Cornwall as early as 1602, the taking of them was apparently at that time a matter of small importance in comparison with the pilchard fishery. Dr. Borlase,² writing in 1758, mentions that 'the mackrel is taken in great plenty on the southern coast of Cornwall'; but it would seem, from his observation that the fish is 'not only of use when fresh, but is salted and pickled and kept all the winter to the great relief of the poor,' that there was no sale except in the immediate local market. This was, no doubt, due to the difficulties of transport.

The fact that such enormous quantities of these fish are to be found in the western waters in the spring must have been attracting attention very soon after Dr. Borlase's time, and the knowledge of this led to efforts to convey the fish to larger and more distant markets. In 1815 Dr. Paris³ remarked of Mousehole and Newlyn that 'the pilchard and mackerel fisheries are here carried on to a very great extent . . . and in the early part of the season they supply the London market with mackerel which are conveyed by way of Portsmouth.'

The trade thus once established grew steadily in importance, and as a consequence the boats engaged increased both in size and numbers, decked boats of 40 ft. keel and upwards taking the place of the smaller open or half-decked boats previously used. In 1850 a lugger large enough to carry 1,400 fathoms (more than a mile and a half) of nets was fitted out at Polperro.⁴ The opening of through railway communication between Penzance and London in 1859 naturally had a great effect on an industry to which quick transport is so essential. 'In 1860 fish to the

value of £80,000 was sent from the Land's End district to the London and large provincial markets.'⁶ Mr. Edmonds, writing in 1862, says 'there has never been so great a number of men employed in building large fishing boats in Mount's Bay as during the last year or two . . . the boats, too, which are now built are larger by some tons than their predecessors.'

About 1875 the number of boats engaged was between 300 and 400, including several from Lowestoft and other ports on the east coast of England, which had then recently begun to come west for this object. At that time the quantity of fish landed was on an average about fifty tons per day amounting to 3,000 or 4,000 tons for the whole season, while each boat carried from a half to three-quarters of a mile of nets. The number of boats coming from the east coast to take part has steadily increased, and since 1896 they have come from Yarmouth and other ports, as well as Lowestoft. During the last three or four years a large number of steam-boats from the east coast ports have taken part. These are much larger craft than the sailing boats, and carry as much as three miles of nets each.

The number of boats engaged in this particular fishery during the season of 1905 was estimated at 500, of which 20 hailed from

⁵ Beyond a few newspaper notices and magazine articles, very little has been written upon horticulture as a Cornish industry. For this reason the writer is especially indebted to the following gentlemen who have generously given him the benefit of their knowledge and experience in the composition of the foregoing article:—The Rev. A. T. Boscawen, of Ludgvan Rectory; Mr. J. C. Daubuz, of Killiow; Mr. Andrew Lawrey, of Varfell; Mr. W. M. Gluyas, of Scilly; Mr. J. W. Lawrey, of Calstock; and Mr. R. M. Martyn, of Padstow. To Mr. T. A. Williams, of the G.W.R. Office, Penzance, he is indebted for the statistics of the flowers and vegetables sent by train.

⁶ R. Edmonds, *The Land's End District* (1862), 226.

¹ R. Carew, *Surv. of Cornw.* 35.

² D. W. Borlase, *Nat. Hist. of Cornw.* 269.

³ *A Guide to Mount's Bay*, 72.

⁴ J. Couch, *The Hist. of Polperro* (1871), 113.

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Porthleven, 80 from Newlyn, 50 from Mousehole, 80 from St. Ives, and 270, of which the majority (more than 200) were steamers, from Lowestoft, Yarmouth, and the other east coast ports.

In quantities of fish the season of 1905 was unprecedented. The total value of fish of all kinds landed at Newlyn for the three months March, April, and May was £168,000. This includes trawl fish, but the mackerel represent probably at least three-quarters of the total, and this would mean about 30,000 tons of fish, giving an average of 400 tons or 600,000 fish per day.¹ In consequence of the enormous catches, the fish were selling on several occasions in May at 1s. per 120,² and large quantities were carted off for use as manure. In addition to the fish landed it was estimated that not less than 500,000, for which no sale could be obtained, in consequence of the glutted condition of the market, were thrown overboard from the fishing-boats into the sea.

This spring mackerel fishery, which has now become one of the great industries of England, is carried on by drift nets exclusively, and the habits of the fish which lead them to congregate in enormous numbers off the extreme south-western coast make Newlyn in Mount's Bay the natural headquarters and the fish market. The fish appear first at the end of February or the beginning of March to the south of the Lizard, and gradually move westward, until at the end of May they are found to the south and west of the isles of Scilly.

Mr. Pezzack reported that in the middle of May, 1905, the fish extended over an area of more than 100 miles west-south-west of the Wolf, and in such quantities that although the catches were enormous and continuous the shoal did not appear to diminish. In addition to the fish caught on the south and west which are landed at Newlyn, a considerable quantity are taken in the mouth of the Bristol Channel to the north-west of St. Ives by drift boats from that port. The season comes to an end with the month of May, when the great mass of fish disappears. In some years they come off the coast again in the autumn in sufficient quantities to enable the large boats to use their drift nets.

There are altogether in the ports of Cornwall about 300 boats engaged in the mackerel drift-net fishery, of which about sixty are east of the Lizard, 150 in Mount's Bay, and eighty at St. Ives.³

Mackerel appear in considerable quantities

¹ These figures are from the report of Mr. J. Pezzack, the fishery officer of Cornwall County Council.

² Mackerel are always counted by the 'hundred,' which contains 120 fish, or in large quantities by the 'last,' which contains 10,000. They are sold by the 'hundred.'

³ Mr. Pezzack's Report.

near the shore in the bays on the south coast during the summer in small schools, each of which is a number of fish from 5,000 down, travelling in a crowd huddled together. They are then caught in seines made and kept for the purpose. Unlike the drift fishery, most of the mackerel seine fishery is to the east of the Lizard, and out of some forty-seven seines thirty-one are at these ports and sixteen in Mount's Bay,⁴ and none at St. Ives. In addition to these large industries mackerel, which are to be caught all the year round, are taken on hand lines, but the quantity landed from this source is insignificant, and is readily absorbed in the locality where they are caught.

The pilchard fishery, which is now second in importance to the spring mackerel fishery, was until about thirty years ago the most important, as it is by far the oldest. There is no record of its origin, but in 1594 it was of sufficient importance to be recognized in an Act of Parliament (35 Eliz. c. xi), which provided that no stranger should transport any 'pilchers' or other fish in cask unless such person should previously have brought in a proportionate amount of 'Clapboard fit for cask or else of Cask.'

Richard Carew⁵ mentions that in his time pilchards were exported to France, Spain, and Italy. He gives no figures of the quantity of fish caught or exported, but he states clearly that 'the deare Sale beyond the seas' affected both the supply and the prices in the local markets. In more recent times the bulk of the export trade has been to Italy. The fishery flourished steadily through the seventeenth and the eighteenth centuries, and Dr. Borlase, in 1758, after a short account of the method in which the fish were caught, wrote concerning the pilchard that 'ships are often freighted hither with salt, and into foreign Countries with the fish carrying off at the same time part of our tin. The usual produce of this beneficial article in money is as follows:—By an exact computation of the number of hogsheads exported each year for ten years, from 1747 to 1756 inclusive, from the four ports of Fawy, Falmouth, Penzance, and St. Ives, it appears that Fawy has exported yearly 1,732 hogsheads, Falmouth 14,631 $\frac{3}{4}$, Penzance and Mount's Bay 12,149 $\frac{3}{4}$, St. Ives 1,282; in all amounting to 29,795 hogsheads. Every hogshhead for ten years last past, together with the bounty allowed for each hogshhead exported, and the oyl made out of each hogshhead, has amounted, one year with another at an average, to the price of one Pound sixteen shillings and threepence, so that the cash paid for pilchards exported has at a medium annually amounted to the Sum of £49,532 10s.'⁶

Pilchards have always been counted by the hogshhead, and the uncertainty as to the exact

⁴ Ibid.

⁵ R. Carew, *Surv. of Cornw.* 33.

⁶ Borlase, *Nat. Hist.* 273.

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size of this measure at different times makes it somewhat difficult to compare the figures of one period with those of another. About 1600 the contents of the hogshead were apparently measured by the number of fish, for Richard Carew¹ says that 'on packing they keepe a juste tale of the number that every hogshead contayneth, which otherwise may turn to the marchants prejudice: for I have heard that when they are brought to the place for sale, the buyer openeth one hogshead at adventures; and if hee finde the same not to answere the number figured on the outside he abateth a like proportion in every other, as there wanted in that.'

But the traditional size of a hogshead of pilchards is $4\frac{1}{2}$ cwt.² when packed, and as the oldest of the fishermen learnt this from their fathers and grandfathers, it may be fairly assumed that the hogshead of Dr. Borlase's time was of this capacity. It contains about 3,000 fish, and this gives an annual average export in the middle of the eighteenth century of more than eighty-nine millions of fish.

One hundred years later the average annual export was 21,732 hogsheads,³ or about sixty-five millions of fish. In 1847 the total was 40,883 hogsheads (122 millions of fish), which is probably the largest on record for a single year.

In consequence of a decreasing demand for the fish by Italian markets, and an increase in the pilchard fishery off the north-west coast of Spain, the export from Cornwall has diminished to a great extent in the last thirty years. The fish are still plentiful enough, and, as Mr. T. Cornish said in 1883,⁴ 'we could easily find thirty or forty millions of fish for the supply of a fresh fish market without feeling the loss of them.'

The pilchard is a small fish of the 'herring' family, generally about ten inches long, and less than half a pound in weight. Although it is occasionally caught off Exmouth and Seaton in South Devon, it practically confines itself to the coast west of the Start Point in Devonshire and Trevoze Head in Cornwall. In these waters it usually appears in July, coming from the west in large schools. A small quantity of scattered fish are sometimes taken in the drift nets in June.

During July the bulk of the fishery is in Mount's Bay; in August and September, in Mount's Bay and to the east of the Lizard; and in September and October, chiefly off St. Ives and the north coast.

It is caught both in drift nets and in seines, and the methods in use to-day are the same as those which were in use 300 years ago. In 1602 R. Carew wrote that 'the Drouers hang certain

square nets athwart the tide thorow which the schoell of pilchard passing leave many behind entangled in the meshes'; a short but accurate description equally applicable to the drift fishery now.

It would seem from his remark that 'the Sayners complayne with open mouth, that these drovers worke much prejudice to the common wealth of fishermen and reape thereby small gaine to themselves; for (say they) the taking of some few breaketh and scattereth the whole Schools and frayeth them from approaching the shore . . .', as though the drift fishery was at that time a comparatively new thing, but he does not say so definitely. As the pilchard fishery is everywhere conducted close to the shore, and in the bays on the coast, the boats engaged in the drift-net work are much smaller than the mackerel drivers, being usually about thirty feet long; even smaller boats are sometimes used, and the men go out driving in the fine summer evenings in open hookers or gigs of as little as twenty-two or twenty-five feet.

St. Ives has the largest number of these pilchard drivers, the total being about 200. A large number of these come to Newlyn in July, as at that time the fish are more plentiful on the south coast, returning to St. Ives in August, as the quantity of fish increases on that side of the land.

The Mount's Bay ports have about 170 boats (Porthleven 90, Mousehole 50, Newlyn 30), and there is a goodly fleet of about 60 at Port Isaac, which are largely engaged in pilchard driving in the autumn. In the ports east of the Lizard there are altogether about 100⁵ (Polperro 40, Mevagissey 30, Looe 20), and many of these boats are also used for the local mackerel drift fishery, which is not the case west of the Lizard, where the smaller boats are not suitable.

The pilchard seine fishery is even more of an inshore fishery than the drift. The seines are of the same kind as are used everywhere, but have a smaller mesh than those used for mackerel, and the method of saving the fish is slightly different. In catching mackerel the seine, when shot round the school, is towed into shallow water, and the foot of the net hauled up into the seine boat so as to enclose the fish in the net itself; but the enormous size of a school of pilchards,⁶ compared with one of mackerel, makes this method impracticable in dealing with the local fish. When the fish are safely surrounded by the seine,

⁵ Mr. Pezzack's Report.

⁶ A school of mackerel averages from 2,000 to 5,000 fish. A school of pilchards on the south coast (i.e. in the early part of the season) averages less than 500 hogsheads, or 1,500,000 fish; on the north (i.e. the later part of the season) they are usually larger. The greatest recorded number taken in one seine was at St. Ives in 1868, when 5,600 hogsheads, or more than 16,500,000 fish, were saved. Almost as many were taken there in one seine in 1851.

¹ R. Carew, *Surv. of Cornw.* 33.

² Of recent years the fish have been packed in 'half-hogsheads,' each containing 236 lb.

³ *Trans. Penzance Nat. Hist. Soc.* i, 444.

⁴ 'The Mackerel and Pilchard Fisheries.' International Fisheries Exhibition Conference, 1883.

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another net called the 'tuck-net' is passed under the fish inside the seine itself, and the fish are lifted bodily to the surface and so taken into the boats.

At all the chief places of the pilchard seine fishery the local fishing ground is divided by shore marks into regular areas or 'stems,' and the boats take up their stations on these 'stems' in regular rotation. When a school of fish comes into the 'stem' the boat whose turn it then happens to be has the first right to shoot her net. This custom, intended to prevent quarrelling amongst the seiners, was of great service in the days when there were large numbers of pilchard seines in use, and is enforced at St. Ives by an Act of Parliament.¹

The seine fishery for pilchards has declined very largely in the last twenty or thirty years, and there are now fewer boats engaged in the whole county than there formerly were at St. Ives alone. The total now is about forty-four, of which ten are at St. Ives, twelve at Cadgwith and Mullion on either side of the Lizard, the only four in Mount's Bay are at Porthleven, there are nine in the coves near Falmouth, and single ones at Penberth, Porthgwarra, and Newquay, and six at Sennen, whose fishing ground is in Whitsand Bay, near the Land's End.²

The fish intended for export were until recently prepared by a method known as 'bulking,' which had been used for more than 300 years; they were placed in the fish cellars in layers with alternate layers of salt, and pressed with heavy weights until the oil and blood were driven out, which result was attained in two or three weeks. The fish were then taken out and washed and packed in hogsheads and again pressed. For some years now it has become the more usual practice to put the fish with salt into large tanks and leave them for some two or three weeks until they are thoroughly pickled, instead of 'bulking,' and to press them with screw presses when they are in the hogsheads.

The oil, of which the pilchard contains an enormous quantity in proportion to its size, is collected in tanks, and finds a steady sale in English markets.

The fish, when packed in this manner, are called locally 'fermades' (fumados), a name derived from the fact that at one time they were smoked; the term still survives, although that method of curing went out of use more than 300 years ago.

R. Carew,³ after describing the custom of 'bulking,' which was the same in his time (1602) as it is now, adds 'those that serve for the hotter Countries of Spaine and Italie they used at first to fume by hanging them up on long sticks one by one in a house built for the nonce, and there drying them with the smoake of a soft and con-

tinuall fire, from whence they purchased the name of fumados; but now, though the terme still remaine, that trade is given over . . . ' and the fish were packed in hogsheads just as they are to-day.

The herring is an inhabitant of the cold water, and is not found off the coast of Cornwall in such quantities as in the northern and eastern waters of England. In fact Cornwall lies across the extreme southern limit of the range of this fish so exactly, that whereas there is a regular herring fishery from the ports on the north coast, especially Port Isaac and St. Ives in the late autumn, it is only occasionally that they are taken in any quantity on the south coast. It is curious that the southern limit of the range of the herring is so closely identified with the northern limit of the range of the warm water pilchard. St. Ives is the chief centre of the Cornish herring fishery, and there the average annual export amounts to about 2,000 tons, or perhaps six millions of fish. They are caught exclusively in drift nets, and usually in the larger boats, but in some seasons the fish are so near the shore that open boats and large gigs can be used. The fish are sent to English markets by rail.

The common shellfish, crab, lobster, and crayfish, are caught all round the coast, and the fishing employs about 370 boats, the majority of which (about 250) are in the ports east of the Lizard on the south coast, the largest number being at Mevagissey. This distribution of the fleet is probably due not to any absence of the fish from the western or northern waters, but to the fact that the sea to the east of the Lizard is more sheltered, and not so continuously troubled by the great seas and strong tides which make fishing in small open boats so precarious off the cliffs and headlands of the south-western and northern shores. Of late years a considerable number of French fishing boats from the neighbourhood of Brest have been employed in taking shellfish in the deep waters off the coast, especially between the Land's End and the isles of Scilly, with success. These are decked boats of about twenty or thirty tons, while the local boats are usually open boats of about twenty-five feet in length. The fish are caught in crabpots, those made of withy being most commonly used. The season is confined to the summer months.

The grey mullet has a habit of congregating in an enormous school at Whitsand Bay, by the Land's End, and sometimes in the smaller bights of the coast between that and St. Ives, in the winter months. The fish are often seen lying for many days in some inaccessible place under the cliffs, and the men wait until the school moves into shoaler water over a sandy bottom where they can shoot a seine. A catch when it occurs is a great boon to the local fishermen, as the fish are taken in many thousands and sell for as much as 10d. or 1s. each at the boat side, and

¹ 4 & 5 Vic. c. 57.

² *Mr. Pezzack's Report.*

³ Carew, *Surv. of Cornw.*

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this at the time of the year when no other fishing is possible. The fish are exported to French markets.

The deep-sea trawling off the coast is carried on chiefly by the large trawlers from Plymouth and Brixham, and much fish from this source is landed at Newlyn in the spring and early summer; but many of these boats, which are much larger than those of the local fleets, carry their catches to their home ports. A small amount of trawling is done by local boats near the shore, especially in Mount's Bay.

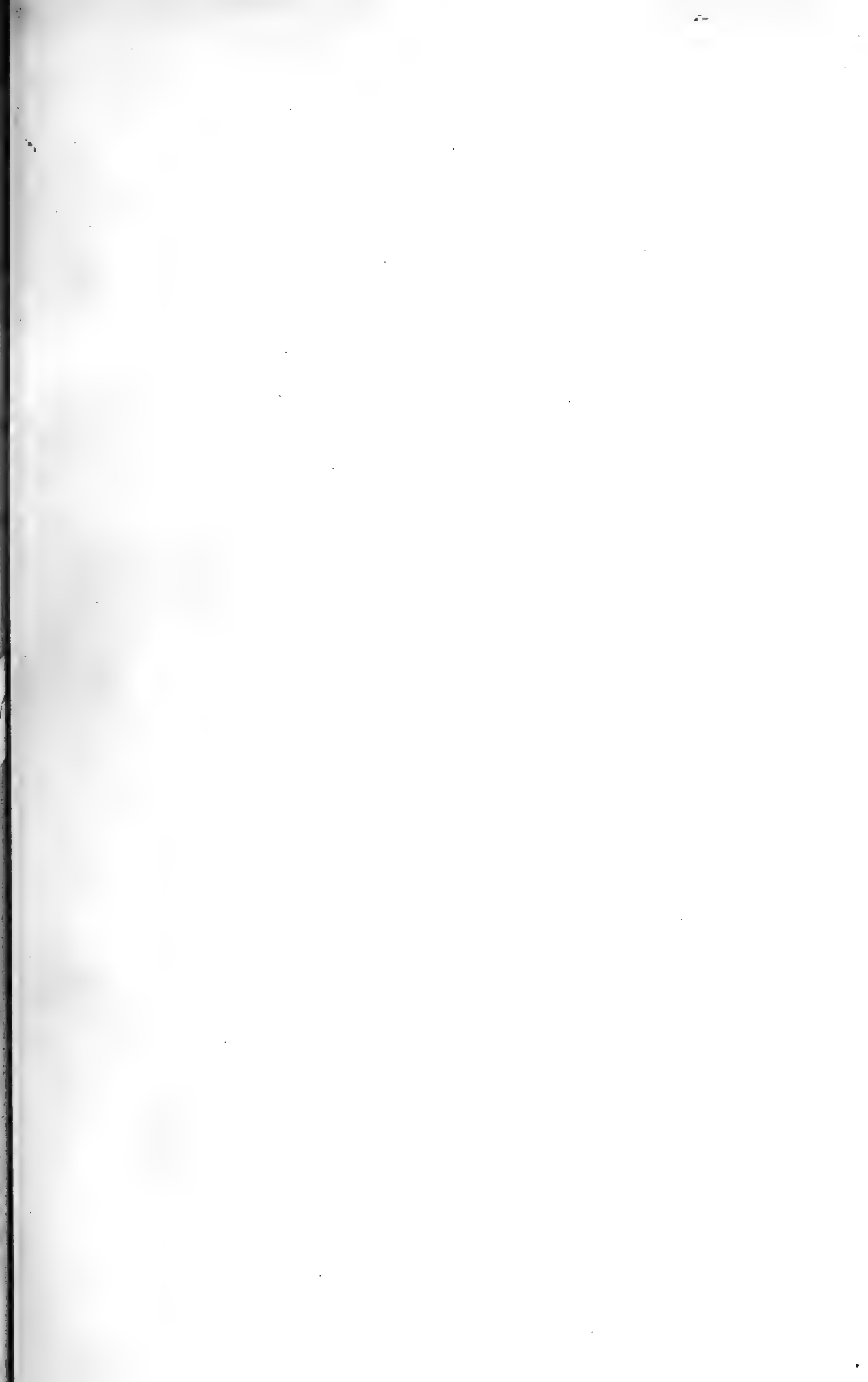
Trammels are chiefly used by the crabbers to catch Ballan Wrasse (locally known as John Ray or Jocky Ralph) and other coarse fish for use as bait in the crabpots, but the surmullet, pollack, and other high-class fish caught command a ready market.

There is a small number of boats employed in fishing with boulders, catching considerable

quantities of the large pollack (a fish which reaches a size of as much as 15 or 16 lb., and is locally esteemed a great delicacy) and conger, with other bottom fish.

The oyster fishery in the Helford estuaries and the several creeks of the Fal was at one time a large and remunerative industry, but from various reasons has fallen off very considerably. Of late years there has been a fair improvement, and about twenty-five boats are engaged more or less regularly at the work.

With the exception of Falmouth, where the boats used are the well-known yawl-rigged Kea punts, and Mevagissey and Polperro, where many of the boats are cutter-rigged, the Cornish fishermen, as a whole, adhere to the old-fashioned dipping lugsail for their boats, in defiance of the common opinion that the inconvenience of working these sails more than outweighs their undoubted sailing qualities.



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